Federation of Rhodesia and Nyasaland

REPORT

of the

SECRETARY

to the

FEDERAL MINISTRY OF AGRICULTURE

For the Year Ended 30th September, 1961

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REPORT OF THE SECRETARY TO THE FEDERAL MINISTRY OF AGRICULTURE

(which includes the Departments of Research and Specialist Services, Conservation and Extension Services, Veterinary Services, and Tsetse and Trypanosomiasis Control and Reclamation) FOR THE YEAR ENDED 30th SEPTEMBER, 1961.

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REPORT OF THE SECRETARY TO THE FEDERAL MINISTRY OF AGRICULTURE

C. A. MURRAY, *Secretary for Agriculture*

1960/61

THE 1959–60 SEASON was an unusually good one and in the Federation resulted in record crops of maize and tobacco, increasing exports of beef, and increased production of dairy products. All these increases were not entirely due to the favourable season but were also influenced by technical advances made possible by the work of the Department of Research and Specialist Services, the Tobacco Research Board, the Department of Conservation and Extension and by increased efficiency on the part of producers.

In many items of agricultural production the country has moved from a state of deficiency to self-sufficiency through technological advances and through improved production practices, and the maximum use of economical uses of the means of production becomes of tremendous importance.

As production increases, the question of marketing grows more complex and important. In so far as marketing is organized through statutory boards, the requirements for capital grow in order that the boards may be geared to accept and market the produce and it is indeed unfortunate that at this stage, when our agriculture is poised for yet further advances, capital is in such short supply.

In the field of marketing, particularly in getting our surpluses on to the world's markets, the physical limitations such as those imposed through port capacities, and which are beyond our control, become increasingly of concern.

There can be no doubt that agriculture, particularly in the subsistence sector, must play an increasing part in the development of the Federation. The potential is enormous and will be developed to an ever-growing extent through intensive settlement schemes, development of irrigation projects, improved farming practices and advances generally through research and experiment. Agricultural development is essential to give purchasing power and a reasonable living to many of our people and, incidentally, to provide employment and an internal market for locally based industry.

The possibility of Britain seeking membership of the European common market — a possibility which has now become fact — has been the major factor in the international field. During the year Mr. John Hare, Minister of Labour in the British Government, visited the Federation to get an understanding of the problems which would face this country in the event of Britain joining the common market. The Minister of Agriculture and officials of this Ministry took part in the discussions.

During the year it was necessary for me, accompanied by the Chairman of the Tobacco Export Promotion Council of Rhodesia and Nyasaland, and the Under Secretary, Economics and Marketing, to visit the United States of America in connection with United States disposals of surplus tobacco. This subject was also raised by the Federal delegation to the G.A.T.T. I am pleased to report that, as a result, satisfactory arrangements for consultation have been conluded with the United States authorities.

CROP PRODUCTION

TOBACCO

A major feature of the year's activities has been the coming into force of the new Tobacco Marketing and Levy Act, 1961, which created new statutory boards in the South-Western and North-Eastern areas and constituted the Tobacco Export Promotion Council on a truly federal basis. The 1960-61 season saw yet again a record crop of flue-cured tobacco. In the South-Western area there were 3,145 registered growers, an increase of 46 over the previous season. A total of 233,349,259 lb. of South-Western area flue-cured Virginia tobacco was sold with a total value of £32,879,152, an increase of £1¾ million over the previous season. The average price of 33.82d. per lb. was slightly below the previous year's average of 34.16d.

The United Kingdom continued to be the major market and almost half of the crop was destined for this market according to the buyers' declarations.

South-Western Area	*lb.*	*per cent.*
United Kingdom	109,594,893	46·97
Australia	8,079,756	3·46
Republic of South Africa	1,871,806	·80
Local Market	11,301,538	4·84
Other Markets	102,419,504	43·89
Unallocated	81,762	·04
TOTAL	233,349,259	100·00

The North-Eastern and Nyasaland area flue-cured crop was produced by 93 registered growers and a total weight of 3,428,908 lb. of flue-cured tobacco was sold on the Limbe Auctions, which are supervised by the North-Eastern Tobacco Marketing Board. The total value of this crop was £395,026, giving an average price of 27.65d. per lb. It is not possible to give the markets to which this crop was destined as the buyers state that they are not in a position to furnish returns on this point at time of purchase. Sales on the Limbe auctions of tobacco other than flue-cured were:

	Weight Sold lb.	*Value £*	*Average Price pence per lb. d.*
Fire cured S. Division	3,532,038	244,933	15·28
Fire cured N. Division	12,095,483	1,018,145	20·20
Sun cured	5,261,557	323,024	14·73
Burley	4,554,929	475,554	25·06

Interest is being shown in the production of the fluffy cigarette type Burley tobacco in the South-Western area and prospects for this crop are promising. 22,000 lb. of Southern Rhodesia-grown Burley was sold through private channels in Salisbury at an average price of 20d. per lb.

The 1960-61 Turkish crop was disappointing, largely due to an outbreak of bushy top disease. A total of 902 Europeans and 4,600 Africans were registered as growers. Export permits were issued for the following quantities of Turkish tobacco from October 1960 to September 1961.

	lb.
Australia	172,278
Canada	110,102
Holland	70,471
Malaya	13,101
Portugal	1,245
United States of America	869,913
United Kingdom	46,476
West Indies Federation	3,046
Others	99

Market prospects for this crop continue to be very encouraging but it is essential that the Federation becomes a more consistent producer. It is impossible to build up a demand for a product such as this on world markets unless buyers can be assured of regular supplies. Consideration is being given to legislation to control the marketing of Turkish tobacco in the Federation.

MAIZE

Southern Rhodesia. The 1960–61 crop was an exceedingly favourable one for maize and the crop was a record. The final forecast was that the European-grown crop in Southern Rhodesia would be approximately 5.4 million bags from 375,000 acres, which gives an average yield of 14.4 bags per acre. The African crop was also a good one and it is estimated that deliveries to the Grain Marketing Board from Africans will be 800,000 bags. Maize acreages planted by Europeans in the 1959–60 season were also considerably greater than in the previous two seasons (358,860 acres as compared with 348,880 acres in 1958–59 and 349,270 acres in 1957-58). In the 1959-60 season, despite this increased acreage, production was adversely affected by drought and the total production of 3,149,600 bags, with an average of 8.8 bags per acre, was the lowest since the 1954–55 season.

Northern Rhodesia. Production of European-grown maize in the 1960-61 season is estimated at 1.5 million bags from 105,000 acres, giving a yield of 14.3 bags to the acre. This is a production record exceeding the previous record in 1956-57 by nearly a quarter of a million bags. The Grain Marketing Board and the Ministry of African Agriculture estimated a maize intake of 1,450,000 bags from Europeans and 750,000 bags from Africans. The production of maize by Europeans was slightly lower in 1959–60 than in 1958–59 (1,074,800 bags compared with the 1958–59 figure of 1,119,500 bags). However, there was a slightly reduced

acreage, crop yields remaining at the same level of 10.3 bags per acre. African maize sales rose to 720,500 bags.

Prices. In terms of the Maize Price Agreement for the 1960–61 crop, class "A" maize was fixed at 31s. 6d. per bag, plus a free bag. As the original estimate of 6.27 million bags to be delivered to the Grain Marketing Board during the 1961–62 *intake* year proved too low, a higher proportion will have to be exported than was originally envisaged. At the same time, it later became evident that, contrary to expectations, an exportable surplus resulted from the 1959–60 crop despite drought in many parts of the country. As a result the price of 31s. 6d. will result in an overpayment — a situation which has been aggravated by the fact that in the calculation of the price the cost of the bag, which is a charge to producers in so far as export maize is concerned, was omitted. The selling price was 41s. 9d. in Southern Rhodesia and 41s. in Northern Rhodesia.

Seed Maize. The Rhodesia Seed Maize Association reports that 4,600 acres were sown for hybrid seed production in the 1960–61 season. 1959–60 acreage figures were 4,200, and 77,900 pockets of 100 lb. each were sold. Total hybrid seed production figures from the 1960–61 crop are not yet known but already 60,000 pockets of seed maize have been sold.

SMALL GRAINS

Munga and Kaffircorn (millet and sorghum). The price of class "A" munga was fixed at 35s. per 200 lb. bag for the 1960–61 crop and the Grain Marketing Board's selling price was 40s. 9d. The price of class "S" kaffircorn, which is used for malting purposes, was fixed at 40s. and its selling price was 50s. Class "A" kaffircorn, used as stock feed, was fixed at 38s. and its selling price was 45s.

European production of kaffircorn increased considerably in the 1959–60 season and, despite the unfavourable rainy season, 10,300 bags were reaped in Southern Rhodesia, which shows an increase on the 8,300 bags and 6,300 bags reaped in 1957–58 and 1958–59 respectively. In Northern Rhodesia, European kaffircorn production was 3,300 bags for 1959–60, compared with 490 and 600 bags for 1957–58 and 1958–59 respectively. Kaffircorn sales to the Grain Marketing Board by Africans in Southern Rhodesia fell by some 7,000 bags, compared with the 1959 sales. In Northern Rhodesia on the other hand, kaffircorn sales rose from 5,162 bags in 1959 to 18,171 bags in 1960.

However, despite this increase in production of kaffircorn, some 73,000 bags were imported in 1960. Kaffircorn imports by the Grain Marketing Board for the last three years have been—

Year ending June 1958	.	25,036 bags
Year ending June 1959	.	23,010 bags
Year ending June 1960	.	72,983 bags

This considerable rise in kaffircorn imports has been brought about by the increased demand for kaffircorn for malting purposes in Northern Rhodesia, where the demand is particularly great on the Copperbelt. Southern Rhodesia more or less produces sufficient for its own requirements.

Rupoko (finger millet). The producer price of rupoko class "A" rose from 33s. 6d. per 200 lb. bag in March to 38s. in April. The Grain Marketing Board's selling price is 45s. for class "A", having been reduced from 50s. The large stocks held by the Grain Marketing Board were eliminated and a shortage of rupoko developed in the latter half of the year. The increase in price did not bring forward the anticipated supplies. A further inducement of a bonus of 4s. for rupoko delivered to the Grain Marketing Board before 31st October had disappointing results. The intake by the Grain Marketing Board from the 1960–61 crop is unlikely to exceed 3,000 bags.

Groundnuts. The 1960–61 season proved a good one for groundnuts, especially in the Eastern Province of Northern Rhodesia. However, despite the good season, importations have still been necessary to meet local requirements. European production in Southern Rhodesia increased very appreciably from 10,000 bags of shelled nuts in 1959–60 to 20,000 bags in 1960–61. The African crop was also far better and increased in the same years from 77,000 bags to 170,000 bags. It is, however, still very much below its previous levels (in 1955-56 nearly 300,000 bags were produced). In Northern Rhodesia, European production was 1,000 bags and African production 150,000 bags, compared with 116,000 produced in 1959–60. 100,700 bags were imported during 1960–61 and 70,700 bags were purchased from Nyasaland, compared with 135,000 bags imported during 1959–60 when, in

addition, 54,000 bags were purchased from Nyasaland. The producer price remained at 90s. per bag for grade "A" expressing nuts. The Grain Marketing Board's scheme to export the higher-quality confectionery nuts ("S" grade) did not prove as successful as was hoped and consideration was given during the year to opening up the market for this type of nut. It is felt that production of high-grade nuts will result in a greater quantity of nuts being available to the expressing and ration trade. The market for groundnuts appears to be substantial and there is great scope for expansion. The Eastern Province groundnut crop disposals are given in the table below:

1960–61

Quality	*Long Tonnage*	*Price*	*Value*
Graded confectionery . . .	958	£94 c.i.f. London . .	£90,052
Screened 8 mm. conf. trade .	208	£85 c.i.f. London . .	£17,680
Screened 9·5 mm. conf. trade .	600	£90 c.i.f. London . .	£54,000
Export peanut butter . . .	70	£68 c.i.f. London . .	£4,760
F.A.Q. conf. trade	3,670	£81 c.i.f. London . .	£297,270
F.A.Q. conf. trade	2,707	£62 f.o.r. Salima . .	£167,834
G.M.B. rations and oil trade .	2,397	£56 f.o.r. Lusaka . .	£134,232
Rejects	101		£5,050
Local sales and seed . . .	366		£14,640
	11,077		

COTTON

Preliminary production figures for the 1960–61 crop for both Northern and Southern Rhodesia are 2.98 million lb. of seed-cotton. There has, admittedly, been an increase over the past four years (1954–55, 1955–56 and 1956–57 production figures were below the half-million lb. level), but when these production figures are equated with the estimated current demand in the Federation for textile fibres of 13 million lb., it can be seen that fibres have to be imported from outside. Of Nyasaland's crop of 27 million lb. of seed-cotton, 75 per cent. is purchased by Southern Rhodesia.

Current seed-cotton production in the Federation is just under 30 million lb., which is roughly equivalent to about 10 million lb. of lint. The potential demand for fibre (synthetic or otherwise), assuming the whole of the market requirements were met by local spinning, has been estimated at 50 million lb., plus 15 million lb. of waste material. Thus Federal requirements could only be met by an increase of approximately five times the present production of lint. This would require some 150 million lb. of seed-cotton. These figures do not include raw cotton exports from the Federation.

The high yields obtainable from irrigated cotton high-light the potential of the Sabi Valley, where cotton could be an important crop when this area is developed. The increased effectiveness of pest-control measures has increased the cotton yield potential of the highveld areas, but inadequate rainfall can only be overcome by supplementary irrigation. The Ministry considers that there is much room for profitable expansion of cotton production and is taking all steps possible to induce expansion of the area under cotton and to open up new areas for the crop.

FRUIT

The deciduous fruit crop continues to increase. Marketing difficulties were experienced with plums. This was due not only to the heavier crops but also to the fact that the size of the fruit was small and there was considerable consumer resistance to this. The Agricultural Marketing Council considered the marketing of deciduous fruit and recommended that the establishment of a Deciduous Fruit Board be considered. The growers also requested the formation of such a board and a marketing expert from South Africa has visited the Federation to give advice on this matter. There is continuing interest in the production of grapes and favourable results have been achieved from the acreages so far planted. Producers have produced wine and there appear to be prospects for a local vinecultural industry. During the year, a Vine Growers' Association was established.

Local production of citrus has also increased and exports overseas have commenced. Interest is being shown in the local production of bananas and there is scope for a considerable increase in this crop.

POTATOES

The usual seasonal pattern of production was apparent throughout the year, characterized by shortages prior to the lifting of each crop. Importations were necessary in October 1960, just before the lifting of the second irrigated crop, and again in February 1961, prior to the lifting of the summer crop. Severe late blight infestation in Southern Rhodesia's first irrigated crop cut production by approxi-

mately 30 per cent. Importations were necessary in June, July, August and September. However, a South African potato shortage curtailed importations and the acute potato shortage within the Federation resulted in very high prices in these months during 1961. Imports of table potatoes for the 11 months ending November 1961 were 95,435 pockets, compared with 92,595 for the 12 months of 1960.

Legislation has been proposed for the establishment of a Potato Board in Northern Rhodesia and is in the process of being drafted by the Crown Law Officers. This will be circulated to interested parties for their views.

Potato production in the Federation is handicapped by the fact that no outlet exists for surplus production. The European market is somewhat inflexible and the threat of loss in returns by over-production discourages an increase in production up to the full market requirements.

Rice

The Nyasaland rice crop was again insufficient to meet the Federation's requirements and import permits were issued for approximately 1,000 tons. The 1960–61 crop, however, appears to be sufficiently large to make the need for imports unlikely.

Sugar

Sugar production continues to increase on the three large estates in the Victoria lowveld and Zambezi valley. In addition to the estate production, settler production has commenced and one farmer in Northern Rhodesia is producing to supply the local African market. It is expected that local production will meet requirements within the next two years and the Federation has made preliminary approaches for a quota under the Commonwealth Sugar Agreement.

Vegetables

The tariff of 1d. per lb. on imported vegetables has encouraged local producers and the period of protection has been extended until 31st December, 1962. Imports of fresh vegetables have been declining. In 1958, the value was £77,647, in 1959, £50,111; in 1960, £31,216, and the nine months to September, 1961, £26,946. During 1961, consignments of imported vegetables to Bulawayo decreased very considerably but imports to Salisbury increased, due almost entirely to the weather conditions prevailing during the year. The rains continuing late into May resulted in conditions unsuitable for the growth of vegetables.

Wheat

There has been little change in the situation regarding local production of this crop and, in the light of the various technical and economic factors surrounding this crop, the Ministry does not expect any significant alteration in this position in the near future. This is not to imply that the Ministry has no interest in the crop — indeed, recent work by the Research Department has resulted in yields of up to 20 bags per acre under field conditions without any apparent loss of quality. The Ministry considers that the present price of 60s. per bag, albeit in excess of import parity, is, at present farm-yield levels, still insufficient incentive in comparison with the alternative opportunities open to producers in lines such as maize, but cannot see any justification for a price level higher than this. Indeed, the hope is that it will be possible to breed a high-yielding wheat suitable for production under irrigation in the cool season and capable of yielding economic returns at a lower price, and to use the planned developments in the Sabi Valley as the means of increasing production to meet local needs. The Ministry is directing its efforts to this end.

Other Crops

Coffee. Increased plantings of coffee have taken place in the Eastern Districts of Southern Rhodesia and a Coffee Growers' Association was formed during the year. The local market is small and producers must therefore look mainly to the export market. World prices are depressed by over-production and large stocks, and appear likely to remain so. However, the quality of local production is receiving favourable comment overseas and should sell well once the product becomes established. The coffee produced in the Northern Province of Nyasaland is being sold through East African Co-operative Societies.

Soya Beans. During the course of the year under review a committee of the Ministry considered the production and market prospects for this crop, in the light of the knowledge that increasing interest was being stimulated in the crop on two fronts — that of an alternative for maize in those areas ecologically suited to it,

and as a crop in its own right suitable either for the export market in its unprocessed form or as a valuable stockfeed and an important source of vegetable oils for local consumption and industrial processes. The committee concluded that additional trial plantings were desirable and necessary to meet the increased interest in the crop but that at this stage of development the likely production could not justify large-scale investments on the expressing and industrial side, nor could that be expected until the marketed crop rises to significantly larger levels. A small-scale plant for expressing has recently been ordered by the Pig Industry Board and if this proves successful may point the way for additional development.

In order to further stimulate interest and to achieve this significant increase in as rapid a manner as possible, the Ministry is embarking on an intensive propaganda and development campaign among producers, as it is confidently believed that there is a very good future for this crop.

Sunflowers. A decortication plant has been installed in Salisbury and it is hoped that, with an assured market, production will increase. The oil compares well with groundnut oil and an increase in this crop would reduce the need for imports of groundnuts and oil. In addition, the crop is useful for livestock feed and trial plantings will be made to see if yield per acre, which is at present a limiting factor, can be improved.

Tea. Nysaland had a record crop during 1960–61 and increased plantings continue in the Eastern Districts of Southern Rhodesia. The prices received on the London market have been very encouraging.

PASTORAL PRODUCTION

CATTLE

The accounts of the Cold Storage Commission for the year ending 30th June 1961 showed an operating loss of £310,093, compared with a profit for the previous year of £301,688. The major reasons for this swing are:

(a) higher average price paid by the Cold Storage Commission for cattle. This was due, not to any change in the grade and price schedules, but to the changed pattern of delivery which was also influenced by the previous year's drought;

(b) drop in value of hides;

(c) carry-over of costs of drought relief measures;

(d) loss incurred through freezing down of top-grade hindquarters. This was also to some extent a result of the drought, as this was surplus of top-grade beef in October and November which had to be stored because shipping space was not available.

The usual drop in the Cold Storage Commission's selling price of beef to butchers during the period March to August did not take place. Prices were kept up because of the loss taking place. Consideration was also given to a permanent increase in the Cold Storage Commission's selling prices and this was subsequently agreed to.

Details of Cold Storage Commission price increases to butchers are:
The price of Rhodesia's Best was increased by 1s. 6d. per 100 lb., Imperial by 8s. 6d., Standard A, 12s. 6d.; G.A.Q., 6s. 6d.; F.A.Q., 8s. 6d.; Compound and Inferior, 6s. 6d., and an additional 10s. was placed on forequarters.

Whilst the 1960–61 season was a good one, nevertheless, the cattle industry was still affected by the aftermath of the drought and this can be seen by comparing the slaughterings and changes in proportions of the grades of the cattle delivered to the Cold Storage Commission.

	1959–60		1960–61	
Grade	*Weight, lb.*	*per cent.*	*Weight, lb.*	*per cent.*
Rhodesia's Best . .	1,865,974	1·82	2,636,390	2·68
Imperial	4,886,940	4·75	7,829,271	7·95
Standard A . . .	20,564,155	20·00	24,940,943	25·33
G.A.Q.	31,812,779	30·94	33,358,737	33·87
F.A.Q.	20,786,124	20·21	15,757,953	16·00
Compound . . .	18,679,154	18·16	11,572,811	11·75
Inferior	4,241,541	4·12	2,378,338	2·42
TOTAL . . .	102,836,667	100·00	98,474,443	100·00

The industry suffered from outbreaks of foot and mouth disease which, because of restrictions necessary for control purposes, has reduced the number of cattle offered to the Cold Storage Commission, particularly in the lower grades.

During the year, the Ministry examined the seasonal price pattern in detail and, after discussion with interested parties, a new schedule of prices, which will come into effect on the 1st April 1962, was published. This schedule has reduced the differential between winter and summer prices in an attempt to obtain a pattern of deliveries better suited to the requirements of the market, both within the Federation and on export. At present, supplies of high-quality cattle are concentrated excessively in the latter half of the year and it is felt that a more even supply would assist in increasing the local demand for this product. These months of heavy supply also coincide with a period of slack demand on the Smithfield Market and export would be more profitable during the summer period.

The new price schedule was announced well in advance to give producers time to adjust to the changes in emphasis which have been found necessary by experience. The effects of the schedule will be examined closely and the pattern of prices will be adjusted if found necessary.

Exports have continued to the United Kingdom and these exports represent approximately 12 per cent. of total slaughterings. The Federation has also a valuable trade in tinned beef and meat extracts. Export of meat extracts for 1960–61 totalled 389,454 lb., valued at £208,090, and tinned meat 7,759,351 lb., valued at £1,247,196. Exports in 1959–60 were respectively 543,153 lb., valued at £255,371, and 6,975,080 lb., valued at £1,025,936. Beef is exported to the United Kingdom in the chilled and frozen form and the lower-grade beef is boned and sent in cartons. Export of frozen beef in 1960–61 totalled 10,546,862 lb., valued at £710,519, compared with 8,299,118 lb., valued at £659,678 in 1959–60. Export of chilled beef in 1960–61 was 7,958,931 lb., valued at £547,683, compared with 5,820,391 lb., valued at £395,312, in 1959-60. Offals are also exported and totalled 2,311,840 lb. for £128,368 in 1960–61, compared with 2,977,611 lb. for £155,279 in 1959–60.

The quality of Rhodesian beef has been commented on favourably at Smithfield and our prices only show a very slight discount over Australian and Argentine beef. Unfortunately, the bulk of our exports occurs during the latter months of the year, when the Smithfield Market is slack, and the price schedule is being amended in April 1962 to try to encourage a more desirable pattern of production and deliveries.

The Ministry continues to examine means of stimulating and improving the industry as the country is well suited to cattle production and the increasing population requires animal protein as an essential item of diet. The industry is essentially one of a long-term nature and inevitably suffers some ups and downs due to seasonal factors, changes following upon developments through research, and improved husbandry and other causes. It is, therefore, essential that changes in policy and prices should be moderate in order to avoid disruption through uncertainty. It is necessary for the Cold Storage Commission to build up substantial stabilization funds to cushion changes. Unfortunately, past profits could not be so used because of the necessity for expansion of the Cold Storage Commission and the shortage of loan funds.

I regret to report that the post of General Manager of the Cold Storage Commission has not yet been filled. It is of great importance that a person of proved and outstanding ability should be appointed, but difficulty is being experienced in finding a suitable person to accept the post.

Dairy

Last year I drew attention to the fact that the present trend of production and whole-milk consumption must lead to a continuing decrease in the average price paid to producers. Monthly pay-outs have been—

	Southern Rhodesia (*a*)	*Northern Rhodesia* (*b*)
	d.	d.
1960		
October	38·8	40·5
November	37·5	39·8
December	27·6	29·0
1961		
January	27·5	29·1
February	29·0	31·75
March	35·3	38·0
April	35·5	39·0
May	35·6	39·0
June	36·7	40·43
July	39·3	44·0
August	38·5	44·5
September	37·5	44·75

(*a*) Subject to adjustment when actual average net realization value known.
(*b*) Higher prices due to Separation-on-Farm Scheme mentioned below.

Despite this trend, production has increased as the table below shows—

DAIRY MARKETING BOARD

	Intake, '000 gals.	*Wholemilk, '000 gals.*	*Surplus, '000 gals.*
1958–59 . .	12,379	7,348	5,031
1959–60 . .	13,815	7,178	6,637
1960–61 . .	14,307	7,162	7,145
	Co-operative Creameries of Northern Rhodesia		
1958–59 . .	2,847	1,656	1,211
1959–60 . .	3,076	1,711	1,365
1960–61 . .	2,766	1,688	1,078

The 1960–61 figures for the Co-operative Creameries of Northern Rhodesia are not directly comparable with the previous years, due to the compulsory separation-on-farm scheme which that concern brought in during the year.

I also reported that the best prospects for the dairy industry lay in an expansion of sales of whole-milk to Africans. Much effort has been put into this and I am pleased to acknowledge the co-operation given by various local authorities to assist sales in African townships. Unfortunately, results to date have not been particularly encouraging. It must be realized that the aim will take time to achieve and the effort will have to be a sustained and continuing one.

Milk surplus to whole-milk requirements rose in Southern Rhodesia to 7,145,067 gallons or 49.9 per cent. of intake. The main outlet for this surplus was skim-milk powder, which accounted for just over 2.2 million gallons, followed by cheese production, which utilized a further 1.8 million gallons. Milk separated for butterfat and the sale of the resultant liquid skim-milk, either fresh or in lactic form accounted for a further 2.0 million gallons, whilst the Nestlé's organization were supplied with approximately 0.75 million gallons for the production of whole-milk powder. The balance was utilized for cream, ice-cream, sterilized milk and whole-milk to Portuguese East Africa.

In Northern Rhodesia, surplus milk intake fell, due to the separation-on-farms scheme, from 1,365,000 gallons to 1,078,000 gallons. Cheese production declined from 745,000 lb. in 1959–60 to 546,000 lb. in 1960–61, and towards the end of the year imports were necessary. Supplies of butterfat from cream producers showed only a slight decrease but the operation of the farm separation scheme resulted in a much greater amount of butterfat being available to the creameries, and butter manufacture increased from 231,000 lb. to 322,000 lb. but imports were still necessary from Kenya and South Africa.

With the increased separation of milk for the manufacture of the various by-products in Southern Rhodesia, local butterfat production again showed an increase. Butter manufacture amounted to approximately 2.8 million lb., including butter manufactured from cream supplied by producers. Consumption of butter remained fairly static and it is doubtful whether increased sales will materialize because of competition from margarine and margarine/butter compounds. Imports of butter were made into Southern Rhodesia during the early part of the year but have not been necessary since April. The Butter Import Stabilization Fund continued to operate during the year, as did the Dairy Bonus Scheme.

During the year, the new, long-term Milk Price Agreement with the R.N.F.U. was discussed and it was agreed that the extension of the agreement for a further year, to the 31st March 1964, should be postponed until the Commission of Inquiry into the Dairy Industry had reported. The system of differential prices remained in operation during the year with no changes taking place in respect of the guaranteed prices, which remained at 51d. per gallon for the months July to November, 37d. per gallon for the period December to February, and 47d. per gallon for the months March to June. These prices were paid for milk sold as whole-milk plus a safety margin equivalent to 62,500 gallons per month in Southern Rhodesia and 20,800 gallons per month in Northern Rhodesia.

The retail prices for whole-milk remained unchanged and the levy imposed on producer-retailers of 1d. per pint on whole-milk sales within controlled areas remained in force. Retail prices were reduced by 1d. per pint in Northern Rhodesia for a short period from December 1960 to February 1961. This reduction in price, however, had little effect on whole-milk sales.

Imports of hard-type cheese, namely cheddar and gouda, were necessary from June 1961 and, in addition, exotic types of cheese were also imported. Local production of roquefort cheese was increased and imports have been reduced considerably. In Southern Rhodesia, wholesale and retail prices of locally produced cheddar and gouda were increased by 1d. per lb. during July 1961, mainly as a result of statutory increases in minimum wage rates.

The Gazaland Co-operative Cheese Factory Ltd. continued operations during the year and the special subsidy payable to this factory continued.

Production of skim-milk powder by the Dairy Marketing Board increased during the year as a result of a rise in demand and a concerted sales drive. This increase in demand was doubtless influenced by the imposition of a duty of 3d. per lb., from May 1961, on imported powder and increased sales promotion by the Dairy Marketing Board. Driers for the production of spray-dried powder came into operation during the year and both roller- and spray-dried powder were produced at the Gwelo factory.

With the commencement of operations by the Nestlés factory in December 1960, locally produced whole-milk became available. A duty of 9d. per lb. on imported whole-milk powder was introduced in February 1961, although 3½d. per lb. of this duty was immediately suspended. It is apparent that imports of powder are continuing in spite of the duty.

Following a majority vote of shareholders, the Co-operative Creameries of Northern Rhodesia went into voluntary liquidation prior to being taken over by a Federal Statutory Board. Negotiations on this move are still proceeding and it is hoped to reach a conclusion soon.

Pigs

Pig production continued to meet the requirements of the country and no imports were necessary. There was, however, a slight imbalance between baconers, which tended to be well supplied, and porkers, which tended to be short. At its 1961 review, the Agricultural Marketing Council recommended—

(a) that the existing price brackets for all classes of pigs were unrealistic and should be generally amended to higher levels and in the case of grades "A", "B" and "L" to a wider range;

(b) that there be relative increases in the price levels of "L" grades and for good, over-weight grades;

(c) that the maximum prices for sows and boars should be removed;

(d) that Colcom Co-operative Limited be requested to give a formal undertaking to refer to the Minister of Agriculture any changes proposed by it in the prices actually paid for "A" and "B" grade pigs.

Of these recommendations, Government was able to accept only (b), (c) and (d), and also accepted the widening of the bracket for "L" grades. These recommendations were implemented on the 24th April 1961.

Pig slaughterings in Southern Rhodesia showed a slight overall decline from 129,649 in 1960 to an estimated 116,000 in 1961. Slaughterings of baconers, however, increased from 53,000 to 55,000, whereas slaughterings of porkers decreased from 36,000 to 34,000.

Sheep

During the year the Cold Storage Commission introduced a trial grading scheme for mutton and lamb, but, unfortunately, this was only possible at Salisbury, due to lack of grading staff. It is hoped to provide this service elsewhere as soon as staff become available. It is hoped that this will encourage local production and indicate the types required. Imports continued under quota arrangements and there is great scope for a considerable increase in local production.

Poultry and Eggs

Supplies of poultry declined somewhat during the year and imports were necessary on occasions to meet special demands, such as the Bulawayo Trade Fair, and to prevent a shortage in Northern Rhodesia. However, there are indications that production of turkeys has increased and requirements for Christmas should be met from local supplies. Eggs were in adequate supply throughout the year.

DEPARTMENT OF RESEARCH AND SPECIALIST SERVICES
ANNUAL REPORT FOR THE YEAR ENDING 30th SEPTEMBER, 1961

DR. B. S. ELLIS, *Director of Research and Specialist Services*

STAFF

THE STAFF POSITION is less reassuring than it was last year when the situation already gave some cause for disquiet. I can only echo what was said in my report then, that the political situation, magnified and distorted by the world Press, has prevented many people overseas from applying for posts in the Federation, particularly as the very considerable increases in salaries in countries from which we draw our recruits, as well as in the Colonial Service and other competing agricultural and research organizations, make a career here less attractive than formerly. As I have stressed on many occasions in the past, the Federation has benefited more than is realized from the quality of its agricultural research. I think I may repeat that good research depends on good men, and is impossible without them.

Several important posts are unfilled, and what is perhaps most unfortunate of all is that the post of Chief Horticulturist, for the fourth year running, has failed to attract a suitable applicant, although one or two, who seemed eminently suitable, only withdrew at the very last moment. It is now proposed that the best of the scientists in the Ministry who would wish to be considered shall receive intensive training in South Africa and overseas to fit him for the post, and applications will shortly be invited.

The general staff position is indicated in the following table:

Establishment:

Superscale Posts	17
Senior Professional Officers	35
Professional Officers	63
Farm Superintendents	3
Farm Managers	6
Farm Assistants	1
Field Staff	2
Senior Technical Research Officer	2
Technical Research Officer	3
Technical Maintenance Officer	1
Senior Instructors	6
Instructors	5
Senior Stockman	4
Stockman	1
Technical Assistants	33
Senior Milk Recorder	1
Milk Recorders	10
*Senior Tobacco Pest Inspectors	1
*Tobacco Pest Inspector	6
Senior Plant, Fruit and Grain Inspector	1
Plant, Fruit and Grain Inspector	4
Senior Meat Grader	1
Meat Graders	13
†Other Posts	6
Contract Post	1
Higher Executive Officers	2
Clerical/Typists	32
African Posts—Branch III	36
African Posts—Branch IV	46
TOTAL	342

*These posts were transferred to Conex on 1st July, 1961.
†Other posts consists of 1 Curator (Botanical Gardens), 1 Warden/Librarian (Chibero), 1 Handyman (Henderson), 1 Groundsman/Handyman, 1 Senior Matron, 1 Assistant Matron (Gwebi).

Resignations:

Technical Assistants	26
Professional Officers	9
Superscale Posts	1
Clerical Posts	5
TOTAL	41

(Includes 1 death and 1 retirement.)

Transfers:

	From Dept.	*To Dept.*
Technical Officers	7	—
Professional Officers	7	7
Clerical Posts	3	4
TOTAL	17	11

Appointments:

Technical Assistants	19
Professional Officers	9
Clerical	6
TOTAL	34

Vacant Posts:

Superscale	1
Professional Officers	13
Technical Assistants	4
Instructors	4
	22

AGRICULTURAL RESEARCH COUNCIL

The Director of the Agricultural Research Council, who had been appointed at the end of the previous year, did not in fact take up his appointment until June, when he began a survey of the situation preparatory to making his first proposals. Dr. Pereira has had very frequent discussions in the department and has visited most of the research stations and branches. He has discussed his observations and the conclusions he has reached, with the Secretary and the Director of Research and Specialist Services. What is proposed will in fact have become public by the time this report is published and clear indications will doubtless have been obtained as to whether it can be implemented, in whole or in part. In brief it is proposed that teams of research workers, recruited largely in Britain, shall work in the Federation, either in new laboratories or on established research stations, on basic and fundamental problems, and that really adequate library and biometrical facilities for all research workers shall be established centrally. The proposals visualize considerable expenditure.

There has been in the Federation for some years a prototype for a team approach of the sort proposed, and that has been the Cotton Pest Research Scheme, financed jointly by the Federal Government, the Government of Nyasaland and the Colonial Development and Welfare Fund. Under this scheme, which has been frequently referred to in these annual reports, a research team is attached to the Gatooma Research Station and works very closely with officers of this department. Under the auspices of the scheme fundamental research is done at the University College of Rhodesia and Nyasaland.

The scheme has worked very well indeed and has produced results of importance to the cotton industry, but the general extension of this type of co-operation, collaboration and intensification as envisaged by the Research Council, may lead to certain difficulties which should be recognized. The teams will consist of graduate research workers with post graduate experience in their particular disciplines; they will be able to concentrate on research exclusively, and are likely to have every encouragement in obtaining the equipment and the facilities they need. They will be in the employ of the Agricultural Research Council and will enjoy entirely different conditions of service from the people with whom they will be closely associated. There will be, in effect, an expatriate service working under very favourable conditions, grafted on to a residential settled community which has already done some very good work under circumstances not always easy, and which is capable, with comparable facilities, of doing a great deal more. There is bound to be dissatisfaction in the resident staff, among whom are many scientists of outstanding ability, and serious thought will have to be given as to how this can be reduced or overcome. The benefits to research, and indeed to agriculture, of a solution to many of the more fundamental and intractable problems, are so great that nothing must stand in the way of a concerted concentrated team approach. As I said in the Council, we in the Federation are an energetic, adaptable, inventive people and I am quite sure that from the various components of research we shall build up a system and a structure adapted to our own peculiar needs.

RESEARCH

At a short meeting of the Departmental Research Advisory Committee in the middle of the year it was agreed, though not unanimously, that the annual planning visits of the committee to research stations in August and September should be discontinued this year. Among the reasons for this decision was the important one that policies for the various stations had been formulated as a result of previous meetings, that they were understood by the stations and that they should be given an unfettered, unhampered chance to settle down and demonstrate their value and their suitability. It was felt that the time of the year was particularly bad and difficult because, at that time, all senior officers were heavily committed

on estimates and annual reports, as well as on preparations for the coming season, and also because there was virtually nothing to be seen on the stations. Accordingly it was decided that several stations would be visited during the coming rains, on a trial basis, that the implementation of the agreed policies could then be studied, and any proposed amendment discussed, more realistically than had always been the case in the past.

Only one meeting of the Federal Research Advisory Committee was held, to discuss proposals for the continuation of the Cotton Pest Research Scheme put up by Mr. Pearson, and to decide on the future of the Advisory Committee itself. The meeting, which was attended by Dr. Pereira, was met by the Secretary who discussed the question of the Committee's future. After an interesting exchange of views it was agreed to recommend to the Standing Committee on Agricultural Production that the Federal Research Advisory Committee, expanded to cover a wider field, should act as one of the consultative advisory specialist committees of the Agricultural Research Council.

THE FEDERAL STANDING COMMITTEE ON AGRICULTURAL PRODUCTION

This important committee which includes the Directors of the territorial departments of Agriculture, economists, other senior scientists and administrators, met several times during the year to discuss a wide range of subjects. One meeting in Salisbury was extended to a further day to enable members to see something of the implementation of the Native Land Husbandry Act. Among the subjects receiving particular attention, apart from more or less continuing preoccupations such as agricultural policy, were large-scale irrigation schemes and all aspects of rural developments as affecting unemployment.

DEPARTMENTAL CONFERENCE

Early in the year under report the Department held its most ambitious and certainly its most successful Specialists' Conference which was opened by His Excellency the Governor of Southern Rhodesia, Sir Humphrey Gibbs, and attended by a very representative gathering which included Dr. Pereira, Dr. Greene from Rothamsted and, I am pleased to say, a considerable number of scientists from Northern Rhodesia and Nyasaland. The subject was "Farming Systems and Land Use", and I believe the proceedings will form an excellent source of reference to the progress of research into all aspects of this very important subject in the Federation.

CHIBERO AGRICULTURAL COLLEGE

The close of the year saw Chibero Agricultural College within two days of opening its doors to its first students. So has culminated more than four years of discussion, investigation and detailed and painstaking planning. The buildings and facilities must be among the finest of their kind in the world and its establishment will surely be a landmark in the history of the Federation. There were in the final stages of recruitment many disappointments and frustrations and the College was certain to start with nine students when it had been hoped that eighteen would enter the initial course. Every effort will be made to see that the widest possible publicity is given to the College, but I am confident myself, as is the College Council, that we shall in the near future have as many applicants as we can accommodate and that it will not be many years before extensions are necessary.

COMMITTEES AND BOARDS

Attendance at committee meetings, frequently as chairman, with the essential preparatory work that involves, takes up much of the time of the Director of Research and Specialist Services. Apart from the more or less continuing committees there were two this year of special importance. The first was in connexion with the Phillips' Advisory Committee on African Agricultural Production. A large number of working parties were set up to provide the essential factual information, with deductions based on it, with which the committee could work. This department was very strongly represented on the various working parties. I personally was attached to the one dealing with research. In this field we hope to extend the close relationship which has developed—and been tacitly accepted—between our department and the Department of Native Agriculture, on a more permanent, more rational and more closely integrated basis.

The other was a new high-level Sabi Valley Development Committee which visited the Sabi-Lundi area and which will shortly be reporting.

Another committee which met during the year was a working party to lay down the phased programme of the new Small Intensive Unit at Henderson and to recommend the personnel of this Unit's Advisory Committee.

The other regular and continuing committees and boards are as follows:

Federal Standing Committee on Agricultural Production (Chairman).

Federal Research Advisory Committee (Chairman).

Departmental Research Advisory Committee (Chairman).

Fertilizer Advisory Committee (Chairman).

Agricultural Research Council.

Tobacco Research Board.

Seeds Research Advisory Committee (Chairman).

Tsetse and Trypanosomiasis Committee.

Scientific Advisory Committee.

Committee on Irrigation and Drainage.

Rhodes Inyanga Orchards Liaison Committee (Chairman).

Senior officers of the department served on numerous inter-departmental and other committees.

VISITS OUTSIDE THE FEDERATION

The following officers attended various meetings and conferences or participated in study tours:

Dr. G. R. Bates attended the Annual Meeting of C.S.A. at Pointe Noire, Republic of the Congo.

Dr. H. Wild attended a meeting of the Flora Zambesiaca Board in Lisbon; visited the National Herbarium at Pretoria.

Mr. J. A. Whellan attended the Administrative Council Sessions of the International African Migratory Locust Organization, at Bamako in the Republic of Mali; attended as Chairman the Annual Meeting of the International Red Locust Control Service at Nairobi.

Mr. J. C. Raath made two visits to Pretoria, as the Federal Government representative on the Pig Testing Centres Committee of South Africa; proceeded on an F.A.O. Fellowship to England, the Continent and the United States of America.

Mr. K. S. Ainslie attended a Meat Marketing Conference at Fort Lamy in the Republic of Tçhad.

Mr. V. J. Montague attended the International Symposium on the Production and Certification of Seed Potatoes.

Mr. P. A. Donovan proceeded on an I.C.A. Fellowship to the United States of America.

Mr. H. D. L. Corby went to see work with Rhyzobium at Pretoria University.

Mr. W. P. L. Sandmann on duty whilst on leave in Holland, spent 21 days at the College of Agriculture at Wageningen, 5 days in the Wieringermeer at Kampen and 4 days at Groningen, studying soil microbiology and in particular rhizobia.

Mr. J. M. Rattray went on a Nigerian assignment for the F.A.O. Plant Production and Protection Division.

Mr. J. G. Thompson attended the Fifth Meeting of the Council of Management of the Inter-African Pedological Service and C.C.T.A./F.A.O. Symposium on the classification of soils in Inter-tropical Regions at Paris.

Mr. A. P. McNab did a Diploma Course in Animal Genetics at the Commonwealth Institute of Animal Genetics at Edinburgh, Scotland; visited Hamburg at the termination of this course to attend a conference on Pig Progeny Testing.

Mr. W. E. Kerr visited the U.S.A., Canada, the United Kingdom, Europe and the Middle East under the auspices of the F.A.O. to study seed production, testing and legislation, and returned to duty on 22.8.1960 (also reported last year).

Mr. B. D. Soane attended a Symposium on "Plant Water Relations" at London University whilst on leave in Britain; attended a C.C.T.A. Conference at Nairobi and also an excursion to regional projects.

Dr. D. H. Saunder visited Stellenbosch to discuss with Professor Perold work on copper nutrition of crops and livestock in Southern Rhodesia; and also the horticultural trials at Inyanga with officers of the Western Province Fruit Research Station.

Mr. W. J. Ascough visited N.I.A.E.; Dairy Research Institute; Essex School of Agriculture; Ford Motor Company, at Boreham, and National College of Agricultural Engineering (special study whilst on leave in the United Kingdom).

Mr. G. C. Martin attended an "Inter-African Nematological Conference" at Nairobi.

Mr. G. L. Lloyd took up a Ford Foundation Fellowship to study poultry genetics in the U.S.A.

Mr. F. E. M. Gillham had his study leave extended for a further year to enable him to complete his course at N.C. State College, Raleigh, U.S.A.

Mr. T. H. Vorster is paying an extended visit to Stellenbosch University on duty for 6 - 7 months to enable him to analyse and write up some of his major work at Matopos.

SECTIONAL REPORTS

There follow the annual reports of the branches, stations and agricultural colleges which constitute this department, together with a report on crop production. Although the general purpose of the annual reports is the same there is no specified form of presentation, and by design and intent the shape and style of what he has to relate are left, in each case, to the individual responsible for his own section of the report. Separate reports for Melsetter Pasture Station and Rhodes Inyanga Orchards appear here for the first time.

ACKNOWLEDGEMENTS

I would like to express my appreciation of the efforts of all members of the staff for their loyalty, enthusiasm and hard work, often in the face of disappointment.

I would like as before to mention the close and friendly co-operation between this department and the Department of Conservation and Extension in particular and the efforts continuously made to ensure the most harmonious working of research and extension services. Co-operation with other departments and indeed with other ministries and even governments is equally close and friendly, even though, of necessity, it is more discontinuous. The department continues to face the future with confidence.

CROP PRODUCTION

T. K. SANSOM, *Assistant Director of Research and Specialist Services*

SEASONAL CONDITIONS

THE TWO OUTSTANDING FEATURES of the 1960–1961 rainy season were, firstly, the very patchy character of the rainfall distribution and, secondly, the abnormally high rainfall in April. While there was no decisive break in the rains over a widespread area, there were numerous cases of individual stations recording low monthly totals because they happened to miss most of the falls in their area. Conversely there were isolated very high totals, such as at Greendale, which recorded some 15 or more inches than the rest of Salisbury area over the season. The season began very well in Matabeleland, especially in the Matopos area, but was rather late in starting in other areas. April rainfall was remarkable, being the highest since records began 70 years ago in the Salisbury area. Even in the extreme north of the Federation, where April rainfall is normally considerably higher than elsewhere, monthly totals were much above normal.

In spite of the patchy character of the rainfall distribution and the abnormally high rainfall in April, the country as a whole experienced one of the very best cropping seasons on record.

THE MAIZE CROP

Estimate of Yields

The final forecast of the European-grown maize crop in Southern Rhodesia is approximately 5.4 million bags from 375,000 acres. This represents an average yield of 14.4 bags an acre, which is almost double the yield obtained in the 1959–60 season, and is by far the highest average yield per acre reaped in the country's history.

The acreage planted was more than in the 1959–60 season and is the largest since the 1950–51 season, as the following table shows:

Season	Number of Growers	Area Planted	Crop Reaped	Yield per Acre
1950–51	3,916	343,521	1,176,528	3·42
1951–52	4,095	361,521	2,454,047	6·80
1952–53	4,176	363,204	2,360,011	6·50
1953–54	4,154	359,709	2,678,314	7·50
1954–55	4,170	364,059	2,734,920	7·51
1955–56	4,087	342,509	3,434,797	9·74
1956–57	4,162	371,062	3,777,021	10·2
1957–58	3,997	349,270	3,589,600	10·3
1958–59	4,000	340,000	3,500,000	10·3
1959–60	4,029	350,000	3,080,000	8·8
1960–61 (estimated)	4,250	375,000	5,400,000	14·4

The average yields, in bags per acre, for the principal maize-growing districts were as follows: Gatooma, 14.8; Bindura, 13.9; Shamva, 16.4; Mazoe, 14.6; Salisbury, 16.2; Hartley, 16.4, and Lomagundi, 16.6; giving an average yield of 15.56 bags an acre.

It will be noted that the average yield of the principal maize-growing districts mentioned above is only 1.16 bags an acre more than the average for the whole country, which indicates most clearly what a favourable season it has been as a whole, as in past seasons the average yield of the principal maize-growing areas has been almost double that of other areas. Further proof of the excellent season experienced throughout the country was the fact that the grand championship in the 200-ear class and the most outstanding exhibit in the agricultural section in the Salisbury Show was won by a farmer in the Midlands area in competition from farmers from all the recognized maize-growing areas.

The record crop reaped during the past season is due mainly to the exceptionally favourable season but is also, in no small measure, due to the use of improved seed, such as hybrid seed, and better farming practices, and proves quite conclusively that Rhodesian farmers, when given a favourable season, are able to produce crops equal to those from any other part of the world.

There will be a considerable quantity of maize available for export owing to the very large size of the crop.

The season was one of the most favourable yet experienced as, apart from droughts in very localized areas, rains were adequate, with sunny periods in between, which made for excellent growth and fertilization and the rains continued well into April and maize filled out very well.

RHODESIA SEED MAIZE ASSOCIATION

Final Report for the 1959–60 Season

The largest amount of seed ever produced by members of the Association was marketed during this season. In all, 76,650 pockets of 100 lb. each were sold by agents of the Association. The total comprised 32,000 pockets of large flats, 29,000 of medium flats, 5,000 of small flats, 8,000 of rounds and thicks, and 2,000 of tips. Northern Rhodesia growers purchased 9,927 pockets and local African growers purchased 4,500 pockets. In addition to these, 1,145 pockets of seed of the 1959 crop were sold, making a grand total of approximately 77,500 pockets.

All of the orders for seed were supplied and a surplus of some 300 pockets was available for export.

Very few complaints about the quality of the seed were received and most of these were quite unfounded and others were unreasonable in view of the very difficult climatic conditions under which growers laboured. Growers were favoured with very suitable weather during the planting season and the seed germinated well. The following growth was good.

Interim Report for the 1960–61 Season

During the current season some 4,700 acres were sown for seed by members with sales quotas. Others growing solely for their own use and those on probation planted 130 acres. The total acreage planted for seed production was some 400 acres more than for the previous season. This increase is largely due to the request sent to members urging them to grow more of the No. 12 hybrid, the total area of which amounted to 950 acres, which is about one-fifth of the total acreage. The demand for this seed has been brisk.

Small quantities of seed of single hybrids were distributed to commercial growers at the beginning of the season. Favourable reports have been received from most growers, particularly when the combination was derived from the inbred N3 and S.C.55.

Membership of the Association now totals 100. Maize inspection services have been supplemented by experienced members who have assisted some of the new members who are serving their probationary period. Owing to the growth of membership it has been necessary to appoint a third inspector, who will be ready to assume his duties before the forthcoming de-tasseling season commences.

Seed Maize Prices

There has been no change in the price of certified double hybrid seed of large and medium flats, large rounds, small rounds and certified and uncertified open pollinated seed, but sale of the new grade small flats, which was introduced last year owing to the unfavourable season, has been discontinued.

Hybrid Maize Farm

The fifth crop of single hybrid and inbred seed has now been produced on Panmure Hybrid Maize Farm. The amount of seed produced was more than sufficient to supply all requirements and a considerable reserve has been carried over as a safeguard against a poor crop during the 1961–62 cropping year. Once again the seed produced has been of very high quality and favourable comments continue to be received on its excellence.

As in past years, small acreages of wheat of several different varieties have been planted for the Wheat Breeder in order to bulk up supplies of pure varieties for distribution to farmers.

Burley tobacco experiments, limited to a maximum of five acres a year, have again been planted. The decision taken at a meeting of the Fire-cured Tobacco Committee and officials of this department early in 1960, that no further tobacco was to be grown at Panmure, has been reversed, owing to the fact that there is the possibility of a good export market for this type of tobacco.

The plots of four varieties of sugar-cane continue to grow well and again have not been affected by frost.

WHEAT

Summer Wheat

There has been no progress made in the production of summer wheat and there is very little likelihood of any being made until the weed problem can be

overcome. Trial plots embracing fertilizer, spacing, rate of seeding and spraying trials continue to be done on Government research stations.

Winter Wheat

Production declined again during the past year, when only 5,500 bags were produced from 930 acres. However, there are encouraging signs that irrigated wheat production on the highveld will increase, as the exceptionally high average yield of 19 bags an acre has been obtained from the Salisbury district over a large acreage. Such a yield should make wheat growing a profitable enterprise under irrigated conditions. This high average yield is due to good farming practices as well as to the new varieties which have been bred by the Government Wheat Breeder and which are capable of standing up without lodging to the heavy fertilizer dressings which were needed to produce high average yields.

GROUNDNUT RESEARCH

The Field Officer, Groundnut Research, has, in addition to his research studies, given assistance to the Department of Conservation and Extension in a campaign to popularize the groundnut crop. Tours were undertaken in Matabeleland and Mashonaland, in the Southern Central and Eastern Provinces of Northern Rhodesia and also in Nyasaland.

Contact was maintained with Mr. J. Sellschop, of the College of Agriculture and Research Institute, Potchefstroom, who supplied further seed stocks for trial in the Federation and who, in return, was sent material from Southern Rhodesia for trial in the Republic of South Africa.

Work at the Henderson Research Station continued on similar lines to 1959–60, and was extended to Gatooma, Grasslands and Matopos Research stations. In addition, the Tobacco Research Board assisted the Ministry with a groundnut trial at the Trelawney Station, similar to that done at Gatooma. These extension trials took the form of mass observations on a large range of varietal material, of which Nos. 1–110 were "earlies" sown at all four stations and Nos. 111–160 mainly "lates" sown at Gatooma and Trelawney. At these two latter stations the trial plots were duplicated, with one replicate receiving a top-dressing of gypsum and the other untreated. At Grasslands and Matopos single plots only were used.

Results with the main trials at Henderson confirmed 1959–60 findings in that "early" varieties gave the best yields and that there was no significant difference between ridge and flat plantings. Lifting was again easier from the ridged plots. This year the rains were well distributed and reasonably generous, and "late" varieties matured much better, giving normal shelling percentages. Detailed results will be published in the Henderson Research Station Annual Report.

Yields from the mass observation trials confirmed the need for early maturation if groundnuts are to yield well under Southern Rhodesian conditions. Natal Common and Valencia types gave the highest yields in all four trials, but at Gatooma, on heavy red soil, a moderately early "late" type, Makulu Red (A.S.I.), was a close second to the true "earlies"; it also did well at Henderson on a near-Tatagura type of soil. At Trelawney, on the other hand, Makulu Red showed little promise, while Natal Common types were at an advantage on this granite, sandy soil. No late type appeared to relish the sandveld under the climatic conditions which prevailed this year. At neither Gatooma nor Trelawney was there any obvious response to a gypsum top-dressing.

The Bambey strains of "rosette-resistant" again showed no sign of attack by this disease but, unfortunately, these are very late maturing, not particularly prolific, and gave the lowest yields at Gatooma and Trelawney. A further collection of material obtained from Nigeria arrived too late to be planted at Henderson but was sown at the Sabi Valley Experiment Station under irrigation. Yields were poor but enough seed was obtained for further trials. None of the new lots showed any rosette damage.

A series of regional trials were arranged with the assistance of the Department of Conservation and Extension, and six were successfully completed in Southern Rhodesia. These trials compared Natal Common and Valencia Bunch under eight different fertilizer treatments.

In one trial Natal Common out-yielded Valencia by a significant margin; in two trials Valencia out-yielded Natal; and the differences in the other three trials were insignificant. It is not believed that there is any significant difference in intrinsic yielding power between these two early varieties, as was borne out by a combined analysis of the six trials. On the poorer sands and particularly in areas of low calcium status, Natal Common is likely to do best. Valencia is apt to

suffer in yield owing to loss of pods in the less friable soils, but being earlier than Natal by a slight margin may show to advantage in borderline areas at the higher elevations. At this juncture, farmers are being advised to grow Natal Common and Valencia Bunch in areas where both varieties do reasonably well.

In the fertilizer trials, where a basic dressing of lime was given where needed to bring pH values into the 5.0–5.5 range, using $CaCl_2$ estimations, results were somewhat mixed. At two sites there were significant responses to calcium and phosphorus but, at the other four, differences were insignificant. It is considered that, provided the pH level of the soil is satisfactory and phosphorous not actually deficient, direct fertilization of groundnuts seldom gives an economic return with early maturing varieties under Southern Rhodesian conditions.

A further range of perennial groundnut material has been obtained from South America, Nyasaland and South Africa, and this is being studied, together with previous importations, by the Chief Pasture Research Officer and his staff.

GENERAL CROPS

Potato Production

The demand for seed produced by the Southern Rhodesia Seed Potato Association continues to exceed the supply. The arrangement which was made with the National Parks Board for the maintenance of elite stocks and registered varieties of potatoes on a piece of land above the Mare Dam at Inyanga has proved most satisfactory and is working very well. The land has now been properly fenced and a good seed store has been built, so that the Potato Breeder should have no difficulty in maintaining his stocks of seed.

Sorghum Production

The drive, which was initiated last year, for farmers to grow this country's requirements of K.2 red types of sorghum for malting purposes, and to save the cost of importing these types from the Republic of South Africa, continues, and it is confidently expected that our malting requirements will be fully met in the near future.

Kenaf (Hibiscus cannabinus)

Again no kenaf was grown by farmers for commercial production. The seed stocks which were being held, but for which there appears to be no demand in the future, were sold to the Experiment Station of the South African Sugar Association.

Castor Bean

The small, but steady, demand for castor bean seed, for the extraction of oil for medicinal purposes, continues. Experiments are being conducted at the Gatooma Research Station on variety, spacing, fertilizer and date of planting trials in an endeavour to supply farmers with more specific recommendations on castor bean production.

Agricultural Shows

The Assistant Director of Research and Specialist Services judged the maize and agricultural produce sections at the Salisbury, Bulawayo, Umtali and Gwelo Shows.

Acknowledgements

I am indebted to the Director of Meteorological Services for the information supplied on seasonal conditions.

ANIMAL PRODUCTION

K. S. AINSLIE, *Acting Chief Animal Husbandry Officer*

THE YEAR UNDER REVIEW has been a very good year for cattle production. The drought conditions prevailing in many areas of Southern Rhodesia were relieved by good rains. In these areas, however, cattle movement has been seriously limited by the presence of foot and mouth disease.

THE BEEF INDUSTRY

Below are given figures for the cattle population in the Federation as well as some details of the European-owned cattle population in Southern Rhodesia over the past five years.

EUROPEAN- AND AFRICAN-OWNED CATTLE
IN THE FEDERATION (in thousands)

Year	Federal State		S. Rhodesia		N. Rhodesia		Nyasaland	
	European owned	African owned	European owned	African owned	European owned	African owned	European owned	African owned
1956	1,492	3,136	1,344	1,937	138	891	10	308
1957	1,600	3,190	1,434	1,981	155	892	11	317
1958	1,687	3,320	1,506	2,074	167	917	14	329
1959	1,747	3,384	1,553	2,087	179	955	15	342
1960	1,776	3,310	1,552	1,964	197	1,006	17	340

EUROPEAN-OWNED CATTLE IN SOUTHERN RHODESIA

Year	Total Number	Number of Cows	Number of Calves	Total Losses
1956	1,344,136	485,926	255,071	54,846
1957	1,434,115	524,291	270,093	57,443
1958	1,506,199	563,426	269,384	62,567
1959	1,552,880	555,620	267,134	60,614
1960	1,552,097	575,607	256,085	81,667

In contrast with previous years, there was a slight decrease in the cattle population of Southern Rhodesia. In 1959, a retardation in expansion was noted and the decrease in 1960 is a direct reflection of the drought conditions preceding this year. The effect of drought also resulted in a decrease in the calving rate. The number of cows increased by 20,000, while the number of calves decreased by 11,000, a drop in the calving percentage from 48 per cent. to 44.5 per cent.

This drought influence is further reflected in an increase in the mortality figure.

While the drought was undoubtedly detrimental to the expansion of the beef industry, it must be noted that it was of longer duration and more severe than any previous drought in the areas concerned and, relatively, the set-back suffered was small. This may be attributed to the prompt action of Government in instituting drought relief measures. The increase in breeding stock indicates that the national breeding herd was preserved and that recovery from drought will be more rapid than in previous years.

Supplies of Slaughter Stock

TOTAL FEDERAL SLAUGHTERINGS
(Excluding Slaughterings in Native Areas)

Year	Federation	S. Rhodesia	N. Rhodesia	Nyasaland
1956	303,012	237,069	39,283	26,660
1957	330,717	264,355	37,613	28,749
1958	351,545	282,030	40,366	29,149
1959	402,251	345,894	41,767	14,590
1960	416,016	357,395	43,385	15,236

Number and Grades of Cattle Slaughtered in the Controlled Areas of Southern Rhodesia for the Year ending 30th September 1961.

COMBINED TOTALS C.S.C. PLANTS, SOUTHERN RHODESIA

Grade	Oxen	Cows and Heifers	Bulls	Total, 1961	Per Cent.	Total, 1960	Per Cent.
Rhodesia's Best	5,175½	375½	—	5,551	2·50	3,815	1·59
Imperial	16,366½	876½	—	17,243	7·79	10,028	4·18
Standard	51,046	5,363	—	56,409	25·45	40,606	16·93
G.A.Q.	49,077	29,605	—	78,682	35·49	68,174	28·41
F.A.Q.	20,215½	15,410	—	35,625½	16·07	51,556	21·49
Compound	9,700	11,925½	1,968	23,593½	10·64	49,617	20·68
Inferior	646½	3,862½	59	4,568	2·06	16,115	6·72
TOTAL	152,227	67,418	2,027	221,672	—	239,991	—

COMBINED TOTALS FOR PRIVATE BUTCHERS IN SOUTHERN RHODESIA

Grade	Oxen	Cows and Heifers	Bulls	Total, 1961	Per Cent.	Total, 1960	Per Cent.
Rhodesia's Best	249	134	—	382	1·01	548	1·57
Imperial	1,220	253	—	1,473	3·90	1,796	5·16
Standard A	2,941	1,195	—	4,136	10·96	4,295	12·72
G.A.Q.	4,154	6,492	—	10,646	28·22	9,999	28·72
F.A.Q.	3,788	4,929	—	8,717	23·11	6,583	18·91
Compound	3,112	5,453	1,384	9,949	26·38	9,238	26·47
Inferior	282	2,057	78	2,417	6·41	2,382	6·84
TOTAL	15,746	20,513	1,462	37,721	—	34,821	—

TOTAL CATTLE SLAUGHTERED BY C.S.C. IN NORTHERN RHODESIA

Grade	Oxen	Cows and Heifers	Bulls	Total, 1961	Per Cent.
Rhodesia's Best	281½	11	—	292½	1·06
Imperial	717	24	—	741	2·68
Standard A	3,641	209½	—	3,850½	13·92
G.A.Q.	3,460	1,275½	—	4,735½	17·12
F.A.Q.	5,508½	1,207	—	6,715½	24·28
Compound	5,999½	1,139	628	7,766½	28·07
Inferior	2,868½	665	29	3,562½	12·89
TOTAL	22,476	4,531	657	27,664	—

TOTAL CATTLE SLAUGHTERED BY PRIVATE BUTCHERS IN NORTHERN RHODESIA

Grade	Oxen	Cows and Heifers	Bulls	Total, 1961	Per Cent.
Rhodesia's Best	189½	26	—	215½	0·85
Imperial	1,102	111½	—	1,213½	4·82
Standard A	4,869	615	—	5,484	21·79
G.A.Q.	4,118	2,513	—	6,631	26·35
F.A.Q.	2,127½	2,480½	—	4,608	18·31
Compound	2,233	2,588	306	5,127	20·37
Inferior	334	1,527	29	1,890	7·51
TOTAL	14,973	9,861	335	25,169	—

National statistics reveal that the total supplies of slaughter stock in the Federation during 1960 were greater than in 1959 but that this increase was smaller than that which occurred between 1958 and 1959. Available figures for the year ending 30th September 1961 indicate that while total federal slaughterings might have increased, the slaughterings in Southern Rhodesia in the controlled areas decreased by 16,439. Slaughterings by the Cold Storage Commission decreased by 18,339, while those by private butchers increased by 2,900. The 1960 figures for Southern Rhodesia were increased by drought slaughterings.

It is important to note that the proportions of the lowest three grades decreased very significantly with a consequent increase in the proportions of the higher grades. This reflects an increased interest amongst the beef producers to provide better nutritional conditions for their cattle. Total supplies of beef were well maintained throughout the year, but an alarmingly high proportion of the high grades were supplied during the period September to December. This trend

has resulted in the need to adjust the price schedule for 1962 in order to encourage a more even distribution of grades throughout the year.

Grading services were extended to the Copperbelt during the year under review.

The Cold Storage Commission slaughtered 4,505 calves, and private butchers 10,868 during the year ending 30th September 1961. This represents an increase of only 132 over the previous year. At the controlled centres in Southern and Northern Rhodesia 7,952 immature male stock, 10,569 suitable breeding stock and 2,131 tollies, weighing between 100 lb. and 200 lb. c.d.w., were slaughtered. This reflects a considerable decrease of 3,706 immature male stock and smaller increases in breeding stock (1,311) and tollies (129). This position is satisfactory as it indicates that young steers were better fed. The increase in breeding stock is sufficiently small as to cause little concern.

Production and Marketing

Due partly to a drop in the world price for hides, the Cold Storage Commission suffered a very substantial loss. To this was added a further loss resulting from the significant increase in the proportion of the higher grades of cattle and difficulties in marketing of these increased supplies.

This situation resulted in a strong representation by the Cold Storage Commission for major changes in the price structure. While certain changes were made, and the 1962 prices published in October 1961, these changes were not large enough to upset the equilibrium of the industry but should be of value in encouraging a more even seasonal grade distribution.

A great deal of emphasis has been placed on the need to examine every possible means of increasing the sale of beef, particularly of the higher grades, both internally in the Federation and in the export field. This has resulted in the creation, within the Cold Storage Commission, of a special branch to deal with this most important matter.

PIGS

NUMBER OF PIGS IN THE FEDERATION
(Thousands)

Year	Federal State		Southern Rhodesia		Northern Rhodesia		Nyasaland	
	European-owned	African-owned	European-owned	African-owned	European-owned	African-owned	European-owned	African-owned
1956 . .	65	162	50	47	13	40	2	75
1957 . .	80	188	59	57	18	44	3	87
1958 . .	78	182	58	56	17	46	3	80
1959 . .	79	214	61	47	15	50	3	117
1960 . .	76	165	62	42	12	53	2	70

SLAUGHTER OF PIGS

Year	Federation	Southern Rhodesia	Northern Rhodesia	Nyasaland
1956	113,205	92,438	15,185	5,582
1957	115,870	94,332	15,410	6,128
1958	142,938	113,635	21,069	8,234
1959	152,670	123,280	25,008	4,382
1960	164,396	129,649	31,177	3,570

Pigs Slaughtered in the Controlled Areas of Southern Rhodesia

PIGS SLAUGHTERED BY COLCOM

Baconers			Porkers			Cutters		
Grade	No.	Per Cent.	Grade	No.	Per Cent.	Grade	No.	Per Cent.
A . . .	44,451½	80·47	A . .	14,502	56·07	A . .	1,812	35·08
B . . .	5,639	10·21	B . .	4,920	19·02	B . .	1,044	20·18
C . . .	1,199	2·17	L . .	343	1·33	L . .	55	1·06
L . . .	1,674	3·03	X . .	5,160	19·95	X . .	2,166	41·87
X . . .	2,212½	4·01	Inferior .	941	3·64	Inferior .	96	1·86
Inferior .	62	0·11						
TOTAL .	55,238	—		25,866	—		5,173	—

Underweight			Overweight Baconers		Manufacturing				
						Sows		Boars	
Grade	No.	Per Cent.	Grade	No.	Grade	No.	Per Cent.	No.	Per Cent.
B . . .	318	15·61	Good	672	A . .	3,284	86·44	312	89·66
L . . .	83	4·07	—	—	B . .	444	11·69	36	10·34
X . . .	757	37·16	—	—	Inferior .	71	1·87	—	—
Inferior .	897	44·04	—	—					
TOTAL .	2,037	—		672		3,799	—	348	—

PIGS SLAUGHTERED BY PRIVATE BUTCHERS

Baconers			Porkers			Cutters		
Grade	No.	Per Cent.	Grade	No.	Per Cent.	Grade	No.	Per Cent.
A . . .	376	21·60	A . .	1,831	18·41	A . .	657	20·90
B . . .	80	4·60	B . .	1,433	14·41	B . .	526	16·73
C . . .	16	0·92						
L . . .	—	—	L . .	49	0·49	L . .	49	1·56
X . . .	1,085	62·32	X . .	5,312	53·42	X . .	1,670	53·12
Inferior .	184	10·57	Inferior .	1,319	13·26	Inferior .	242	7·70
TOTAL .	1,741	—		9,944	—		3,144	—

Underweight			Manufacturing		
Grade	No.	Per Cent.	Grade	No.	Per Cent.
B	362	11·51	A	608	75·81
L	1	—	B	147	18·33
X	1,608	51·11	Inferior . .	47	5·86
Inferior . .	1,175	37·25			
TOTAL . .	3,146	—		802	—

Pigs Slaughtered in the Controlled Areas of Northern Rhodesia

PIGS SLAUGHTERED BY COLCOM

Baconers			Porkers			Cutters		
Grade	No.	Per Cent.	Grade	No.	Per Cent.	Grade	No.	Per Cent.
A . . .	4,488	85·24	A . .	2,139	80·17	A . .	180	43·17
B . . .	482	9·15	B . .	420	15·74	B . .	167	40·05
C . . .	88	1·67						
L . . .	95	1·80	L . .	3	0·11	L . .	—	—
X . . .	110	2·09	X . .	103	3·86	X . .	70	16·79
Inferior .	2	—	Inferior .	3	0·11	Inferior .	—	—
TOTAL .	5,265	—		2,668	—		417	—

Underweight			Overweight Baconers		Manufacturing				
						Sows		Boars	
Grade	No.	Per Cent.	Grade	No.	Grade	No.	Per Cent.	No.	Per Cent.
B . . .	42	60·87	Good	79	A . .	220	83·65	17	94·4
L . . .	—	—	—	—	B . .	30	11·41	1	5·6
X . . .	25	27·60	—	—	Inferior .	13	4·92	—	—
Inferior .	2	2·90	—	—					
TOTAL .	69	—		79		263	—	18	—

PIGS SLAUGHTERED BY PRIVATE BUTCHERS

Baconers			Porkers			Cutters		
Grade	No.	Per Cent.	Grade	No.	Per Cent.	Grade	No.	Per Cent.
A . . .	170	50·90	A . .	2,635	62·19	A . .	170	30·09
B . . .	41	12·28	B . .	984	23·22	B . .	208	36·81
C . . .	9	2·69						
L . . .	17	5·09	L . .	16	0·38	L . .	5	0·88
X . . .	93	27·84	X . .	537	12·67	X . .	172	30·44
Inferior .	4	1·20	Inferior .	65	1·53	Inferior .	10	1·77
TOTAL .	334	—		4,237	—		565	—

During the current year ending 30th September 1961, Colcom Products slaughtered 93,311 in Southern Rhodesia, compared with 93,527 during the previous year, while private butchers reduced their slaughtering very considerably to 18,777, as compared with 30,276 in the previous year, a decrease of 11,499.

In Northern Rhodesia, Colcom Products slaughtered 8,779 pigs, while private butchers slaughtered 5,796.

The new bacon factory in Salisbury is almost completed and should be in full operation in November 1961. An effort is being made by Colcom Products to attract African-produced pigs and they hope that this will help to place the throughput on a satisfactory basis.

Progeny Testing

The progeny testing scheme continues to receive good support and more applications have been received during the course of the year than could be accepted.

In view of this, it is planned to extend the accommodation of the station. It is intended to plan this accommodation so that it will also allow the individual performance testing of boars.

The continued support of the scheme has resulted in an increase in the number of boars with three or more litters tested.

A sow recording scheme has been initiated.

The following table gives a summary of the main results of progeny testing:

PROGENY TESTING RESULTS

	Large White	*Landrace*
Age in days at slaughter . . .	194·7	193·5
Gain per day	1·44	1·38
Feed conversion	3·48	3·54
Length of carcass, mm.	820·4	849·0
Backfat—shoulder, mm. . . .	40·5	35·7
midback, mm. . . .	21·5	20·7
loin, mm.	26·5	22·9
Grading	94·2% A 4·5% B 1·3% L	97·3% A 2·7% L

SHEEP

TOTAL NUMBER OF SHEEP IN THE FEDERATION
(Thousands)

Year	Federation		Southern Rhodesia		Northern Rhodesia		Nyasaland	
	European-owned	African-owned	European-owned	African-owned	European-owned	African-owned	European-owned	African-owned
1956 . .	130	210	118	124	9	22	3	64
1957 . .	143	202	130	118	10	29	3	55
1958 . .	159	228	146	144	11	24	2	60
1959 . .	176	248	161	154	12	22	3	72
1960 . .	204	220	188	131	13	23	3	66

SHEEP SLAUGHTERED

(Excluding sheep slaughtered in the Reserves for African subsistence)

Year	Federation	Southern Rhodesia	Northern Rhodesia	Nyasaland
1956 . . .	59,356	47,200	9,728	2,428
1957 . . .	47,881	41,701	4,102	2,078
1958 . . .	52,278	43,263	5,863	3,152
1959 . . .	47,508	40,124	6,593	791
1960 . . .	44,160	39,660	3,636	864

Sheep Graded in Salisbury.

COLD STORAGE COMMISSION

LAMB

Super	*Choice*	*Lamb*	4444
142	1,624	703	235

		MUTTON			RAMS
1111	2222	3333*A*	3333*B*	4444	4444
860	216	401	24	321	20

PRIVATE BUTCHERS

LAMB

Super	*Choice*	*Lamb*	4444
90	678	296	131

		MUTTON			RAMS
1111	2222	3333*A*	3333*B*	4444	4444
480	117	497	29	200	33

Only a very small proportion of the sheep population reaches the markets of the Federation annually. As the federal state is an importer of sheep, scope exists for an expansion in sheep production. There has been an encouraging increase in the number of European-owned sheep, particularly in Southern Rhodesia, while there has been a decrease in African-owned sheep, again particularly in Southern Rhodesia.

Interest in sheep production is increasing in the intensive farming areas of Southern Rhodesia.

GENERAL

As a result of intensive advisory propaganda and the proven stability for livestock products, particularly beef, farmers are increasing the standard of livestock management. This is clearly reflected in the increase in winter supplementary feeding which is taking place.

Close co-operation was maintained with other departments and a considerable amount of advisory work was carried out. It was not possible, however, to provide all the services requested due to lack of staff. The need for an increase in specialist animal husbandry advisory staff, under specialist control, is urgent.

THE DAIRY INDUSTRY

G. M. PHILLIPS, *Acting Chief Dairy Officer*

DAIRYING SEASON

BOTH SOUTHERN RHODESIA and Northern Rhodesia have enjoyed a very favourable season and this has given much-needed relief after the previous season's drought conditions, when extended supplementary feeding was necessary to maintain dairy production.

PRODUCTION OF DAIRY PRODUCE

Preliminary figures indicate that overall milk production continued to increase, although the rate of expansion, as indicated by milk supplies to the Dairy Marketing Board and the Co-operative Creameries of Northern Rhodesia, was significantly reduced. Milk supplies to the Dairy Marketing Board increased by only 3.6 per cent. over the corresponding period for 1959-60, which was considerably less than the trend in recent years. Milk intake by the Co-operative Creameries of Northern Rhodesia decreased by 10 per cent., but this was brought about by the introduction of a compulsory farm separation scheme in the main milk-producing areas. If an estimate of the milk utilized for farm separation was included in the Co-operative Creameries of Northern Rhodesia milk intake, supplies would have attained the previous year's intake.

Whole-milk sales were maintained in Southern Rhodesia but there was a slight decrease in Northern Rhodesia. Sales of skim-milk, both sweet and sour, continued to expand and marketing organizations made strenuous efforts to improve on progress already attained.

Producer price agreements continued to operate and producers were guaranteed a price for milk sold as whole-milk, plus a safety margin, and any supplies in excess of this were paid for at net realization value. In order to reduce the volume of surplus milk used for manufacture, the Co-operative Creameries of Northern Rhodesia introduced a farm separation scheme in Northern Rhodesia. All producers in the Chisamba area and those supplying the Lusaka and Mazabuka dairies participated in the scheme, and separated a specified percentage of their milk production. The butterfat supplied to the creamery was paid for at the ruling butterfat prices.

Cheese manufacture decreased appreciably in both territories, due to increasing quantities of milk being utilized for skim-milk powder manufacture, allocation of milk to Nestlés for whole-milk powder production and to meet increasing demands for cultured skim-milk.

Butter production continued to expand, largely on account of the increased need for separation to supply the skim-milk and skim-milk powder markets.

Production figures for the main commodities are given in Tables I and II for Southern Rhodesia and Northern Rhodesia, respectively. These figures do not include butter and cheese produced on farms, which is relatively small.

TABLE I

DAIRY PRODUCTION 1920–1960—SOUTHERN RHODESIA

Year	Butter	Cheese	Skim-milk Powder (*b*)	Liquid Milk (*a*)	Total Gallons
	(1,000 lb.)	(1,000 lb.)	(1,000 lb.)	(1,000 gals.)	
1920	600	79	—	258	2,000,000
1930	1,768	163	—	1,008	6,100,000
1940	1,686	383	—	2,095	6,910,000
1945	1,224	702	—	3,848	7,750,000
1950	900	394	—	5,720	9,000,000
1955–56	1,083	2,168	—	8,050	13,202,000
1956–57	1,387	2,050	137	9,100	14,900,000
1957–58	1,437	2,240	438	9,600	15,700,000
1958–59	1,881	2,693	934	9,700	17,400,000
1959–60	2,354	2,879	1,504	9,000	18,000,000
1960–61 (*c*)	2,899	1,704	1,819	9,600	18,800,000

(*a*) Milk available for use as liquid milk, skim-milk, fresh cream and ice-cream, and milk powder.

(*b*) Production of skim-milk powder started during 1956–57.

(*c*) Preliminary figures.

TABLE II

DAIRY PRODUCTION 1956–1960—NORTHERN RHODESIA

Year	Butter	Cheese	Liquid Milk (*a*)	Total Gallons
	(1,000 lb.)	(1,000 lb.)	(1,000 gals.)	
1956–57	40	497	1,750	2,400,000
1957–58	56	426	2,330	3,000,000
1958–59	129	851	2,700	4,000,000
1959–60	231	745	2,600	4,000,000
1960–61 (*b*) . . .	316	496	3,040	4,400,000

(*a*) Milk available for use as liquid milk, skim-milk, fresh cream and ice-cream.
(*b*) Preliminary figures.

The only factories operating outside the Dairy Marketing Board and Co-operative Creameries of Northern Rhodesia were the Gazaland Co-operative Cheese Factory at Chipinga, E.M.C.O. Creamery in Umtali, Zambesi Co-operative Dairies in Livingstone and Nestlés in Salisbury. The latter commenced manufacture in December of last year and produced whole-milk powder and baby food. Production at Chipinga was slightly less than in the preceding year, although there was a marked improvement towards the end of the season. E.M.C.O. Creamery butter production remained unchanged and exceeded local requirements. Butter, surplus to local requirements, was disposed of by the Dairy Marketing Board. Milk supplies to the Zambesi Co-operative Dairies increased by 5.7 per cent. over the corresponding period of 1959–60, but as whole-milk sales showed a slight decrease, the dairy had to contend with an increasing surplus over whole-milk requirements. The surplus was disposed of by separation, the skim-milk being sold locally and the butterfat supplied to the Co-operative Creameries of Northern Rhodesia.

The approximate number of suppliers and the total milk intake to the Dairy Marketing Board and Co-operative Creameries of Northern Rhodesia are shown in Tables III and IV, respectively.

TABLE III

THE DAIRY MARKETING BOARD—SOUTHERN RHODESIA

Year	*Number of Suppliers (August)*	*Total Milk Supplied (Gallons)*
1955–56	403	8,852,000
1956–57	416	9,736,000
1957–58	459	10,794,000
1958–59	522	12,379,000
1959–60	531	13,815,000
1960–61	525	14,307,000

TABLE IV

THE CO-OPERATIVE CREAMERIES OF NORTHERN RHODESIA

Year	*Number of Suppliers (August)*	*Total Milk Supplied (gallons)*
1955–56	118	1,431,000
1956–57	125	1,880,000
1957–58	123	2,211,000
1958–59	135	2,867,000
1959–60	137	3,076,000
1960–61	128	2,766,000

There was a slight decrease in the number of suppliers to both organizations but the average production per supplier continued to increase. This is not reflected in the figures for Co-operative Creameries of Northern Rhodesia suppliers, as a certain percentage of the producers' production was utilized for butterfat production on the farm.

CREAMERIES — BUTTER PRODUCTION AND CONSUMPTION

Butter was manufactured at Lusaka, Salisbury, Gwelo and Umtali and a small quantity was also produced on farms in remote areas. Butter production has shown a considerable increase, due to increased separation of whole-milk at the dairies. Butterfat supplies from cream producers in Southern Rhodesia has shown little variation over the last three years, but there was a marked increase in Northern Rhodesia owing to the introduction of the farm separation scheme. Butter production did not satisfy local requirements and the deficiency was met by importation. Local production provided 88.9 per cent. of the estimated consumption in Southern Rhodesia and 24.7 per cent. in Northern Rhodesia.

The production and apparent consumption of butter for Southern Rhodesia and Northern Rhodesia and trends over the past few years are given in Tables V and VI for Southern Rhodesia and Northern Rhodesia, respectively.

TABLE V

PRODUCTION AND APPARENT CONSUMPTION OF BUTTER—SOUTHERN RHODESIA

Year	Production	Consumption	Shortfall met by Importation
	(1,000 lb.)	(1,000 lb.)	(1,000 lb.)
1950–51	767	2,643	1,876
1955–56	1,083	3,650	2,567
1956–57	1,398	3,997	2,599
1957–58	1,445	3,800	2,355
1958–59	1,881	3,545	1,664
1959–60	2,354	3,427	1,073
1960–61 (*a*)	2,899	3,265	366

(*a*) Preliminary figures.

TABLE VI

PRODUCTION AND APPARENT CONSUMPTION OF BUTTER—NORTHERN RHODESIA

Year	Production	Consumption	Shortfall met by Importation
	(1,000 lb.)	(1,000 lb.)	(1,000 lb.)
1956–57	44	1,678	1,634
1957–58	65	1,532	1,467
1958–59	129	1,422	1,293
1959–60	231	1,344	1,113
1960–61 (*a*)	316	1,281	965

(*a*) Preliminary figures.

Importations of butter were received from Kenya and the Republic of South Africa in the following proportions:

	Southern Rhodesia per cent.	*Northern Rhodesia per cent.*	*Total per cent.*
Kenya	0	43·7	29·3
South Africa	100	56·3	70·7

A small quantity of butter was exported to Portuguese East Africa and most of Nyasaland's requirements were supplied by Southern Rhodesia and are included in the consumption figures for Southern Rhodesia.

Butterfat prices to producers remained unchanged, and minimum prices were as follows:

	1st Grade per lb.	*2nd Grade per lb.*
January to March	3s. 6d.	3s. 3d.
April and December	3s. 10d.	3s. 7d.
May to November	4s. 2d.	3s. 11d.

Maximum retail prices for butter in Northern Rhodesia and Southern Rhodesia for the period were as follows:

Northern Rhodesia	4s. 1d. per lb.
Southern Rhodesia—1st Grade	4s. 1d. per lb.
	2s. 1d. per ½ lb.
2nd Grade	3s. 11d. per lb.
	2s. per ½ lb.

There was no price control on other grades of butterfat or butter.

All grades of butter manufactured as a percentage of total production are given in Tables VII and VIII for Southern Rhodesia and Northern Rhodesia, respectively. All butter was graded before sale in Southern Rhodesia, but there is no such statutory requirement in Northern Rhodesia. Dairy Officers in Northern Rhodesia, however, carried out check grading from time to time for advisory purposes.

The quality of butter continued to improve and this is attributed to the increased separation of milk at dairies and the manufacture of fresh-cream butter.

TABLE VII

BUTTER GRADES AS PERCENTAGE OF TOTAL MANUFACTURE—SOUTHERN RHODESIA

Year	First Grade	Second Grade	Third Grade
	(per cent.)	(per cent.)	(per cent.)
1955–56 . . .	86·6	9·8	3·6
1956–57 . . .	87·2	8·6	4·2
1957–58 . . .	87·0	9·0	4·0
1958–59 . . .	88·0	9·0	3·0
1959–60 . . .	92·0	6·0	2·0
1960–61 . . .	93·0	5·0	2·0

TABLE VIII

BUTTER GRADES AS PERCENTAGE OF TOTAL MANUFACTURE—NORTHERN RHODESIA

Year	First Grade	Second Grade	Third Grade
	(per cent.)	(per cent.)	(per cent.)
1956–57 . . .	96·0	1·0	3·0
1957–58 . . .	96·0	3·0	1·0
1958–59 . . .	88·0	1·0	11·0
1959–60 . . .	84·0	—	16·0
1960–61 . . .	93·0	—	7·0

Unsalted butter was supplied to a local manufacturer for the production of margarine containing 10 per cent. butter. All the unsalted butter was manufactured locally.

CHEESE FACTORIES, CHEESE PRODUCTION AND CONSUMPTION

Eight factories were registered for cheese production, six in Southern Rhodesia and two in Northern Rhodesia. Five of the cheese factories in Southern Rhodesia were operated by the Dairy Marketing Board and centred at Bulawayo, Gwelo, Salisbury, Umtali and Gatooma. Cheddar and gouda cheese were the main lines of production at the first four centres and production at Gatooma was devoted entirely to roquefort cheese. The remaining cheese factory in Southern Rhodesia was operated by the Gazaland Co-operative Cheese Factory, at Chipinga, and cheddar cheese was the main product of manufacture.

In Northern Rhodesia most of the cheddar and gouda cheese was manufactured at Mazabuka. Very small quantities of gouda cheese were manufactured at Broken Hill.

Cheese manufacture during the season fell significantly, due to the increasing volume of milk utilized for whole- and skim-milk powder manufacture and increased sales of cultured skim-milk. Production was 2,200,000 lb. and consumption was estimated at 3,426,000 lb. The shortfall, which includes exotic varieties of cheese, processed cheese and cheddar cheese, was met by importation. The production of roquefort cheese at Gatooma increased and the product was finding a ready market.

Table IX shows the percentage of each grade of cheddar cheese manufactured and graded in Southern Rhodesia in recent years.

TABLE IX

CHEDDAR CHEESE GRADINGS AS PERCENTAGE OF TOTAL CHEESE GRADED IN SOUTHERN RHODESIA

Year	First Grade	Second Grade	Third and Below Grade
	(per cent.)	(per cent.)	(per cent.)
1955–56 . . .	94·9	4·2	0·9
1956–57 . . .	96·1	3·5	0·4
1957–58 . . .	97·3	2·4	0·3
1958–59 . . .	93·6	6·1	0·3
1959–60 . . .	96·1	3·6	0·3
1960–61 . . .	93·5	5·8	0·7

The quantity of farmhouse cheese produced was very small and only one producer manufactured cheddar cheese. This farmer and the Gazaland Co-operative Cheese Factory at Chipinga were paid a special subsidy of 6d. per lb. on cheese produced. The subsidy amounted to approximately £4,500 for the year under review.

The wholesale and retail prices of cheese remained unchanged until July 1961, when prices in Southern Rhodesia were increased by 1d. per lb. for first- and second-grade cheddar cheese and gouda cheese.

Milk Supplies and Milk Prices

The milk intake figures of the Dairy Marketing Board showed a further increase in milk production but there was a significant drop in the actual rate of expansion. The figures for the Co-operative Creameries of Northern Rhodesia show an apparent drop in production of 10 per cent. This is not a true reflection of the position, due to the aforementioned farm separation scheme.

The milk intake of the Dairy Marketing Board and Co-operative Creameries of Northern Rhodesia are shown in Tables X and XI, together with apparent consumption of whole-milk and surplus to whole-milk requirements.

Table X

DAIRY MARKETING BOARD—SOUTHERN RHODESIA

Year	Total Milk Intake	Apparent Consumption as Whole-milk	Surplus over Whole-milk Requirements
	(1,000 gals.)	(1,000 gals.)	(1,000 gals.)
1955–56 . . .	8,852	6,388	2,464
1956–57 . . .	9,736	6,654	3,082
1957–58 . . .	10,794	7,158	3,636
1958–59 . . .	12,379	7,348	5,031
1959–60 . . .	13,815	7,178	6,637
1960–61 . . .	14,307	7,162	7,145

Table XI

CO-OPERATIVE CREAMERIES OF NORTHERN RHODESIA

Year	Total Milk Intake	Apparent Consumption as Whole-milk	Surplus over Whole-milk Requirements
	(1,000 gals.)	(1,000 gals.)	(1,000 gals.)
1956–57 . . .	1,880	1,315	565
1957–58 . . .	2,211	1,635	576
1958–59 . . .	2,867	1,656	1,211
1959–60 . . .	3,076	1,711	1,365
1960–61 . . .	2,766	1,688	1,078

As mentioned previously in this report, sales of whole-milk were maintained in Southern Rhodesia but fell slightly in Northern Rhodesia. Milk surplus to whole-milk requirements was disposed of as skim-milk for liquid consumption or manufactured into skim-milk powder, cheese production and the manufacture of whole-milk powder and baby food by Nestlés. The sale of fresh-cream and sterilized milk also provided useful outlets although they represented only a small fraction of the total surplus disposable.

There were no changes in basic milk prices during the year and the producer price agreements continued. Actual producer prices, however, continued to decrease in Southern Rhodesia, due to the increasing surplus over whole-milk requirements, increased manufacturing costs and the difficulty of disposing of an increasing proportion of milk intake as whole-milk. In Northern Rhodesia actual producer prices showed an increase as a result of a lower surplus following the introduction of the farm separation scheme, which involved 10–20 per cent. of the producers' production. Cream supplied was paid for at butterfat prices.

The standard and actual average pay-out prices, excluding quality scheme payments, are given in Tables XII and XIII.

TABLE XII

SOUTHERN RHODESIA

Month	Standard Price per gallon	Actual Average Pay-out, without Quality Payment, per gallon (*a*)	Actual Average Pay-out, without Quality Payment, per gallon (*b*)
	1960–61 d.	1960–61 d.	1959–60 d.
October	51	38·8	40·1
November	51	37·5	39·4
December	37	27·6	29·3
January	37	27·5	29·0
February	37	29·0	29·9
March	47	35·3	36·1
April	47	35·5	36·7
May	47	35·6	36·1
June	47	36·7	36·9
July	51	39·3	38·8
August	51	38·5	38·5
September	51	37·5	38·3

(*a*) Prices subject to adjustment when actual average realization value of surplus milk is established by the Dairy Marketing Board.

(*b*) Prices to June include supplementary payment on surplus milk.

TABLE XIII

NORTHERN RHODESIA

Month	Standard Price per gallon	Actual Average Pay-out, without Quality Payment, per gallon	Actual Average Pay-out, without Quality Payment, per gallon
	1960–61 d.	1960–61 d.	1959–60 d.
October	51	40·5	42·05
November	51	39·8	41·21
December	37	29·0	26·55
January	37	29·1	28·30
February	37	31·75	28·07
March	47	38·00	35·70
April	47	39·00	36·17
May	47	39·00	37·18
June	47	40·43	36·90
July	51	44·0	39·89
August	51	44·5	38·37
September	51	44·75	40·25

The retail prices for milk remained the same in Southern Rhodesia; the price being controlled in areas within a radius of seven miles of the main Post Office in the principal towns. There is no such legal control in Northern Rhodesia and prices are agreed with Government where subsidies are involved. Retail milk price in Northern Rhodesia remained unchanged except for the period December to February, inclusive, when retail prices were reduced by 1d. per pint to stimulate sales. The scheme was, however, withdrawn as the anticipated increase in sales did not materialize.

The retail prices for cash sales were as follows:

Southern Rhodesia: 8d. per pint.

Northern Rhodesia: Copperbelt, 9½d. per pint; Midlands, 8½d. per pint.

Pasteurized Channel Island Milk was sold by the Dairy Marketing Board in Salisbury at 9d. per pint. Sales accounted for approximately 5 per cent. of the total sales in Salisbury. The premium of 1d. per pint obtained, less additional costs incurred by the Dairy Marketing Board, was passed on to the producers of this milk.

Milk intake at the Zambesi Co-operative Dairies increased by 5.7 per cent. over the corresponding period for the previous season. Sales of whole-milk decreased slightly and, owing to the increased surplus, producer prices suffered. The price paid to producers supplying this dairy is determined by the Zambesi Co-operative Dairies Ltd. Bonus payments under the Dairy Production Assistance Scheme continued, and Zambesi Co-operative Dairies Suppliers, eligible for the bonus, received up to 4d. per gallon.

Sales promotion activities were increased by the Dairy Marketing Board and Co-operative Creameries of Northern Rhodesia and particular attention was given to the African market. It is difficult to assess the improvement in whole-milk sales to Africans, but the sale of cultured skim-milk in urban areas showed a significant increase. Increasing the sales of milk and milk products by continued efforts on the part of sales organizations, and making dairy products available over a wider area, must be continued, particularly in African areas, for the benefit of the industry and consumer.

Cream

The demand for fresh cream was met by the main dairies and producer retailers. No reliable estimate of consumption could be made.

Dried Milk

The sales of skim-milk powder continued to increase and large volumes of milk had to be diverted to Gwelo to meet the demand. A new spray-drying plant was installed and came into production in January. The Gwelo dairy is now able to supply both spray- and roller-dried skim-milk powder. This line of production was protected by the imposition of a tariff on imported skim-milk powder. Production during the year under review was 1,819,000 lb.

Most of the skim-milk powder was sold in wholesale quantities in paper bags, but sales in ½-lb. and 1-lb. packets increased rapidly, particularly in the African market.

The establishment of the Nestlés dried-milk factory provides an additional outlet for surplus whole-milk and introduces into the territory whole-milk powder and baby food specialities of local manufacture. The quantity of milk utilized for manufacture during the first ten months of operation was 750,000 gallons.

Dairy Bonus Scheme

This scheme, which operates in Southern Rhodesia, was continued, but the modified scheme, incorporating special conditions for the Chipinga area, was withdrawn. Payments for the 1960–61 year are likely to be £11,000, of which £8,000 will be paid on butterfat and £3,000 on cheese milk in the Chipinga area.

General

Strenuous efforts are being made to increase the sales of milk and milk products and a great potential exists in the African market. Present indications are that the main increase in sales to Africans will be in the form of cultured skim-milk and skim-milk powder.

The extension to the new Salisbury Dairy, providing for cheese and ice-cream manufacture, is nearing completion and all manufacture of milk products in Salisbury should be under one roof in the near future. Facilities will also be provided for the reception and grading of cream but the butterfat will be transported to Gwelo for manufacture into butter.

It is the intention of the Dairy Marketing Board to centralize manufacture of all ice-cream in Salisbury, and equipment is to be installed to provide for the total requirements of the territory. Ice-cream sales showed a decrease during the earlier part of the season, due to increased competition. This decrease has been overcome as a result of intensified sales activity and, in addition, sales of some frozen confections were at a record level.

Consideration has been given to the erection of a new dairy at Gatooma to provide increased handling facilities to cope with the increased milk intake. The new dairy will be erected in stages but roquefort cheese manufacture will continue at the existing premises for the time being.

The Dairy Produce Marketing and Levy Act, 1961, was introduced and it is anticipated that the activities of the Dairy Marketing Board will extend into Northern Rhodesia in the near future. The Zambesi Co-operative Dairies have given further consideration to the installation of a milk pasteurizing plant and processing facilities should be completed at this dairy before the end of the year.

Little progress has been made in the preparation of a Federal Dairy Act. Amendments to the Southern Rhodesia Legislation were introduced in January to provide for the sale of only pasteurized, sterilized and tuberculin tested milk in the main centres. A more comprehensive schedule of standards of composition of dairy produce was also included in the above legislation. Legislation was also introduced to clarify certain sections of the dairy regulations, provide safeguards in respect of proprietary milk foods intended for consumption by invalids and babies, and to provide one standard for all sterilized cream in hermetically sealed containers.

Milk Recording

During the year under review preparation continued for the introduction of the proposed changes to the scheme which were outlined in last year's report. It is hoped to introduce the revised scheme early in 1962.

Itineraries were rearranged during August and September and all outstanding applicants were included in the scheme.

Tables XIV and XV give the production figures for the winner of the milking competition and average production per cow recorded, respectively, in recent years.

Table XIV

PRODUCTION OF WINNING HERDS IN MILKING COMPETITIONS: AVERAGE OF THE BEST 15 COWS IN THE HERD

Year	Milk Section (A)	Butterfat Section (B)
	(lb.)	(lb.)
1955–56 . . .	14,551	486·1
1956–57 . . .	14,908	511·9
1957–58 . . .	14,863	503·6
1958–59 . . .	17,153	592·3
1959–60 . . .	17,497	601·2

Table XV

AVERAGE PRODUCTION PER COW: PEDIGREE AND GRADE HERDS

Year	Number of Completed Lactations	Average Milk Production per Cow	Average Butterfat Production per Cow	Average Butterfat Percentage	Days
		(lb.)	(lb.)		
1955–56 . .	8,095	6,400	250·5	3·91	277
1956–57 . .	9,050	6,683	257·7	3·86	286
1957–58 . .	9,783	6,674	260·5	3·79	277
1958–59 . .	11,432	6,674	270·7	4·06	277
1959–60 . .	12,330	6,643	267·0	4·02	276

The overall average for the recorded herds shows a drop from the previous year's figure, which was probably due to the poor rainy season of 1959–60. It is significant that the leading herd in both sections of the milking competition was kept in an area which was badly affected by drought in the same period.

Branch Activities

The work carried out by the Branch includes inspections and registration of factories and farm dairies, grading of dairy produce, sampling and testing of milk, both for the purpose of the scheme for the payment of milk on a quality basis and for advisory purposes. Lecturing at Gwebi Agricultural College, judging at agricultural shows and operating the milk recording scheme are also included in the activities of the Branch.

The work of the Branch is continually increasing and over 16,000 samples were examined during the year by Dairy Officers for the purposes of the payment on quality scheme for milk, in addition to numerous advisory tests.

The distribution of staff at the end of the year under review was as follows: two Dairy Officers and one Milk Recorder were stationed at Lusaka, one Dairy Officer and one Milk Recorder at Umtali, one Dairy Officer and one Milk Recorder at Gwelo, two Milk Recorders at Bulawayo and the remainder of the staff at Salisbury. The Dairy Officers at Lusaka covered Northern Rhodesia, the Dairy Officer at Umtali the Eastern Districts, the Dairy Officer at Gwelo covered Bulawayo, Que Que and the Fort Victoria areas. The remainder of Southern Rhodesia was covered by the Dairy Officers stationed at Salisbury.

All meetings of the Dairy Marketing Board were attended by the Chief Dairy Officer or his deputy and numerous other meetings were attended by officers of the Branch.

The Chief Dairy Officer was appointed Secretary to the Commission of Inquiry into the Dairy Industry and took up duties in this capacity in September. The publication of the Commission's report is expected before the end of the year and is awaited with interest by all connected with the dairy industry.

It has been difficult to meet all demands made upon the Branch, and on many occasions to do so has necessitated working long hours to maintain services at an efficient level. The loyal and willing co-operation of all officers and staff in meeting the demands made upon them is deeply appreciated.

POULTRY

G. H. COOPER, *Chief Poultry Officer*

THE YEAR UNDER REVIEW has been mainly one of consolidation for established poultry farmers, with returns at the same level as the last few years. There has been increased production in Northern Rhodesia, and the Federation as a whole, was self-supporting in all poultry products at the end of the year, though some importation of table poultry was required earlier when stock from general farms was not available.

EGG PRODUCTION

The available statistics indicate that egg production has remained steady with the tendency, reported last year, of more even production throughout the year, enhanced. Thus there has again been a shorter period of higher prices. This improved position is indicative of better stock and management practices.

The levelling of prices has also been influenced by higher consumption by lower income groups during the period of lower prices, which has resulted in prices being above those suitable for egg-breaking for pulp storage for baking. It is obvious, therefore, that those engaged in this business will have to negotiate improved prices from bakers for this commodity or they will not get supplies.

The average producer price has been approximately 3s. 4d. per standard dozen, with only four months above average in Southern Rhodesia. Prices have been higher in Northern Rhodesia but with the same tendency towards less fluctuation. It would appear that there is a general movement towards lowered numbers of egg producers, but an increase in the size of the flocks on established farms, which are generally more efficient; as the margin of profit on egg production becomes less this situation will become more apparent.

Fewer egg producers with larger flocks will reduce costs by means of greater efficiency, mechanization, labour reduction, etc., and this fact, though perhaps not pleasing to the prospects of the small producer, will certainly mean a cheaper commodity for the consumer. Egg producers close to markets, in particular, are concentrating more and more on establishing cage or battery units, which have been reduced in price. Group cages, that is three to five layers per cage, are also being used, which reduces, still further, the capital costs. Management practices have to be adjusted to the requirements of this system.

Egg grading practices are increasing in the larger consuming centres and outlets for sales continue along the same channels, with a greater proportion being sold by direct sales on a quality basis.

A new farmers' organization in Mashonaland, involving farm grading, cartoning, and delivery, was launched in December, operating on a guaranteed quality basis and although handling costs have not been reduced, sales have been very encouraging. The large central packing station can cut overheads, but quality control — a major factor in egg sales — is lacking and, therefore, the smaller concerns drawing local supplies from a few producers are likely to be more successful.

TABLE POULTRY

The production of broilers has become a major enterprise for some farmers. Owing to considerable competition, the margin on sales is narrow and efficiency in production is essential. There have been several failures, some involving considerable sums of money, whereas others are expanding where they have been successful in obtaining payable weights. The quality of stock available for this trade has improved considerably following the importation since 1958 of high-quality stock from overseas by certain breeders. There is insufficient of this type to supply the full demand, but the position in this respect should improve annually. Farmers engaging in broiler production must realize it is a highly specialized business and should not attempt production on any large scale unless and until they have the capital and knowledge to command success.

The price for broilers has remained steady at 3s. 6d. per lb. in most areas, with a retail price of 4s. 6d. per lb. Recently some producers have been prepared to operate on a lower price, due to increased efficiency in production. There is still a considerable market for table-birds to be taken up within the Federation, as the figures of imports indicate; however, a proportion of these imports is re-exported.

The quality, finish and presentation of table poultry in retail stores has improved significantly over the last few years and will continue to do so, as there is keen competition in the industry.

The sale of roasters is also expanding and, at lower prices than broilers, they find a ready market in super-markets and for the African worker in commerce and industry.

Turkey production has increased significantly this year and quality has also improved, with the result that probably no imports of turkeys for Christmas will be required this year. The breeding of turkey poults for sale is carried out by only one or two breeders. It is hoped others may take up this business to ensure supplies to farmers for rearing, and to prevent the necessity of importing in the future due to a shortage of poults.

The duck market is small in comparison, but sufficient numbers are produced. The position in this respect is similar to that of turkeys, as the production of ducklings is limited to one or two breeders, the majority of ducks being produced on farms in small quantities.

Consideration has been given by the Federal Ministry of Health to the introduction of regulations governing poultry processing establishments in Southern Rhodesia under the Public Health Act. Regulatory requirements are well in hand and it is confidently expected that these may be enforced early in 1962 by Health Inspectors.

FEEDS

The ingredients for constituting poultry mashes have been fully available during the year and there are no important changes to report. The range and quality of feeds provided by manufacturers is comprehensive and meets the producers' requirements for all classes of stock.

Prices have remained the same as in 1960, in most instances.

It is estimated that some 40,000 tons of manufactured poultry feed is sold annually in the Federation, valued at £1,120,000. In addition, considerable quantities of farm-grown grain are fed.

A memorandum on feedstuffs, that might be produced in the Federation for stock feeds to reduce imports, was submitted to the Director of Research and Specialist Services during the year.

The registration of manufactured poultry feeds under the Fertilizers, Farm Feeds, Seeds and Remedies Act has been carried out and all poultry rations have been checked by this Branch.

IMPORTS

Imports of poultry products consisted mainly of dressed poultry. The figures show a slight rise over last year but a considerable quantity was re-exported to the Congo, details of which are not yet available. In this total, turkeys, ducks and game poultry are included. The quantity of dressed chicken imported is, therefore, probably lower than the previous year and was mainly for the Copperbelt market, which is not yet fully supplied.

A determined effort to supply the Federation's requirements of turkeys has been made this year by producers, as already stated, and it is confidently expected that few or no imports will be required in this commodity.

Other imports consisted of day-old chicks and hatching eggs in small quantities for breeding purposes from accredited sources only.

EXPORTS

The export of day-old chickens increased appreciably this year to several neighbouring territories, the Congo being the largest market, in spite of the position in that country. The value of chickens exported, at £43,000, was nearly double that of last year. The value of dressed poultry and eggs was also well above that of last year. Total imports amounted to £26,263 in value and exports to £48,093, a favourable balance of £21,830.

The following tables give the details of the imports and exports for the Federation from August 1960 to July 1961, inclusive, and the number of poultry, poultry products produced, and value for 1960:

TABLE I—IMPORTS

Article and Country of Origin	Quantity	Value
Poultry, live (No.):		£
United Kingdom	1,898	383
Republic of South Africa	1,422	184
United States of America	650	280
Netherlands	7	5
TOTAL	3,977	852
Poultry, dressed (lb.):		
Republic of South Africa	174,894	24,111
United Kingdom	3,051	287
Tanganyika	548	83
TOTAL	178,493	24,480
Eggs in shell (dozen):		
Republic of South Africa	1,928	348
United Kingdom	182	61
United States of America	91	133
Tanganyika	23	3
TOTAL	2,224	545
Eggs, liquid or dried (lb.):		
United States of America	200	338
United Kingdom	74	21
France	23	27
TOTAL	297	386

TABLE II—EXPORTS

Article and Country of Destination	Domestic Produce		Re-Exports	
	Quantity	Value	Quantity	Value
Poultry, live (No.):		£		£
Congo	116,549	31,424	—	—
Kenya	66,386	8,979	—	—
Moçambique	16,708	1,948	—	—
Tanganyika	4,100	529	—	—
Uganda	100	21	—	—
Somalia	100	11	—	—
Republic of South Africa	24	24	—	—
United Kingdom	20	25	—	—
TOTAL	203,987	42,961	—	—
Poultry, dressed (lb.):				
Congo	13,943	2,523	1,804	334
Moçambique	4,916	796	—	—
Republic of South Africa	20	3	—	—
TOTAL	18,879	3,322	1,804	334
Eggs in shell (dozen):				
Congo	6,235	1,235	210	53
Moçambique	618	126	—	—
Bechuanaland	175	47	—	—
Republic of South Africa	12	2	—	—
TOTAL	7,040	1,410	210	53
Eggs, liquid or dried (lb.):				
Moçambique	90	13	—	—

TABLE III

NUMBERS OF POULTRY, POULTRY PRODUCTS, AND VALUE, IN 1960

	Southern Rhodesia	Northern Rhodesia
Fowls:		
Laying hens	316,305	108,929
Other poultry	383,396	138,373
TOTAL	699,701	247,302
Ducks	35,139	5,790
Turkeys	24,650	5,861
Geese	6,911	1,420
Hen eggs sold: No. (doz.)	2,600,201	1,185,608
Value (£)	419,731	212,466
Table-birds sold: Wt. (lb.)	1,518,868	343,071
Value (£)	262,309	61,088
Day-old chicks sold: No.	783,058	133,701
Value (£)	69,651	13,354

These figures show an increase in layers in Southern Rhodesia and a slight decrease in Northern Rhodesia, but the opposite in the case of "other poultry". Eggs and table poultry sold in each territory increased, but the value is lower in Southern Rhodesia, due to the lower price received in that territory.

GWEBI COLLEGE

The Forty-first Annual Official Egg Laying Test concluded on 30th January 1961; a full report was published in the March/April issue of the *Rhodesia Agricultural Journal*. Results were slightly above last year and the stock entered was of a good standard. Slight fluctuations in quality are bound to occur but production results over the last five-year period do show that results are improving. The mortality was well above average, at 17 per cent., due mainly to leucosis. The Cash Score section of the test provided some keen competition, with Rhode Island Reds returning the greatest profit per pen.

The forty-second test commenced on 1st March 1961, all accommodation being taken up. Results to date are better than ever and reflect the stock improvement which is also noticeable on many farms.

Station Stock

The breeding programme, involving inbred strains for both strain and breed crossing, continued. Two lines of the sixth inbred generation of White Leghorn and New Hampshire were crossed to produce pullets for testing "nicability". One hundred of these were tested for winter production with imported hybrids and a local cross bred as controls. The Gwebi stock gave an excellent performance, with slightly better production than the imported hybrid and with significantly larger egg size. Mortality was higher, but not excessive, in the Gwebi birds.

It is pleasing to note that these results can be obtained, but in order to ensure a measure of standardization in the progeny, breeding and testing will continue.

The feeding of "all mash" ration in preference to mash with hand-fed grain has been tried, and results were so successful that all stock are now fed on this system. The advantages of an all-mash ration are that errors in feeding grain are eliminated, there is no chance of birds feeding selectively, feed quantities are more accurately calculated, and labour is reduced.

The annual sale of pedigree stud cockerels was held in March. There were too many birds on offer and also several had been sold out of hand previously; in consequence, the demand was very poor. It has been decided not to hold an auction sale in future but to keep a few cockerels only for private sale at fixed prices, as authorized by the Federal Treasury.

The stock on hand at 30th September was as follows:

Adult birds	600
Growers under six months . .	2,000
Turkeys	100
Waterfowl	47
	2,747

18,410 dozen eggs were sold to the hostel, staff and Salisbury hospitals. 1,492 table poultry were also sold to the hostel and staff. The total revenue from the Poultry Section amounted to £3,883 17s.

Educational

First-year students were given the usual programme of 42 lectures on Poultry Husbandry and practical instruction by the Poultry Section staff.

A special short course for women was advertised, but as only one application was received, it was cancelled.

MATOPOS RESEARCH STATION

Owing to financial restrictions no further building was possible during this year.

An experiment to evaluate the worth of restricted feeding for layers in cages was run during the year, in which layers were restricted to approximately 80 per cent. of feed consumed by controls. Throughout the experiment, egg production from the restricted feed birds was reduced proportionately to the restriction in

feed given. The size of egg was also lowered. It was, therefore, concluded that restriction in feed given under the conditions of this experiment was uneconomic.

The results of the Second Matopos Commercial Laying Test were published in the March/April issue of the *Rhodesia Agricultural Journal*. Production was satisfactory but not good, due in several cases to the class of stock entered. The best team was a White Leghorn/Rhode Island Red cross. The mortality was above average at 13.4 per cent.

SPECIALIST AND ADVISORY WORK

There has been an increased demand for the services of specialist officers in the field, and visits to farms, demonstrations and meetings have been carried out to the full extent of the staff and funds available. In this respect, Northern Rhodesia has been particularly well served, as the Poultry Officer stationed at Lusaka devotes all his time to this work, whereas in Mashonaland, Head Office duties, involving administrative, marketing and other problems in connection with the industry, make it impossible to devote as much time as is desirable to specialist advisory work, where there is the largest concentration of breeders and poultry producers. The time has arrived when an assistant poultry officer, stationed in Mashonaland, is very necessary to undertake most of the specialist advisory work.

In Matabeleland, the Poultry Officer has duties at the Research Station also, but is able to spend enough time on advisory work in that area.

In the Federation some 700 farm visits were paid, of which nearly half were in Northern Rhodesia. Advisory visits of farmers to officers numbered 480, exclusive of visits to the Research Stations. Various meetings of the Rhodesia National Farmers' Union Poultry Committee, Show Societies, Poultry and Breeders' Clubs, etc., were attended, frequently after hours, and in the three areas these totalled 85 meetings. In addition, several articles for the *Rhodesia Agricultural Journal* and the local press were provided by the staff.

Two visits were paid by the Chief Poultry Officer to Northern Rhodesia, and two by the Poultry Officer, Lusaka, to Southern Rhodesia.

VETERINARY

The compulsory testing of all breeding stock, for freedom from B.W.D. and fowl typhoid on farms where poultry is sold, was carried out by the Field Veterinary Service in Southern Rhodesia. In Northern Rhodesia, this service is provided on a voluntary basis.

During the year the first recorded outbreak of epidemic tremor occurred simultaneously in two breeding flocks in the Salisbury area. Affected chickens were diagnosed in Bulawayo and must have also been sent to Northern Rhodesia. These were broiler chickens or crosses, which would not be used for breeding and, therefore, it is unlikely that the disease will spread. The disease is not serious as a flock, once infected, becomes immune. Generally, losses are not high. If replacement is practised by breeders, little loss will be caused except to the breeder, where undue publicity is given as to the seriousness of the disease.

The incidence of chronic respiratory disease would appear to be much improved in all areas, though two farms suffered heavy losses in Northern Rhodesia. The much-improved housing conditions on many farms where ventilation has been increased are largely responsible for the improvement in this respect.

Newcastle Disease in Northern Rhodesia in European flocks was completely controlled by the vaccination programme, but in African areas it is still serious. In 1960, 152,387 doses of Newcastle vaccine were issued in Northern Rhodesia, compared with 74,404 in 1959.

Fowl pox is seen where vaccination is not practised but can be kept completely under control by vaccination. The chicken pox vaccine issued in Northern Rhodesia increased from 95,625 doses in 1959 to 132,245 in 1960. The vaccination programme in Northern Rhodesia has been vigorously pursued by this Branch.

Coccidiosis becomes less of a problem as improved hygiene and more satisfactory drugs are available. It need not be the menace today that it was a decade ago.

Towards the end of the year several cases of what appeared to be haemorrhagic disease in broilers appeared in various parts of the country. Additional Vitamin K provided immediate relief but it is yet too early to say whether this is a straightforward deficiency or whether some other condition is involved.

SHOWS AND POULTRY CLUB WORK

Show Societies in all main areas provided facilities for poultry classes, which, in general, were less well supported than in previous years, but in many cases the quality showed improvement. The Salisbury and District Poultry Club held a Young Bird Show and an Open Show during the year. The Bulawayo Poultry Association also held an Open Show again, after a lapse during the reconstruction of the Show Society and Trade Fair. Poultry Officers in the various centres acted as judges at most of these shows.

The Rhodesia Pedigree Poultry Breeders' Association has increased its membership but, owing to illness and other causes, has had administrative difficulties.

STAFF

The Poultry Officer, Lusaka (Mr. Francis) spent two weeks on a study tour whilst on leave in Britain. Visits were made to the leading breeders, hatcheries, broiler plants, experimental stations and farms, and included a visit to the National Poultry Show and Convention in London.

The Lecturer in Poultry at Gwebi College (Mr. Lloyd) was granted a Ford Foundation study grant and also a Fulbright travel grant. He left for Davis University, California, on 8th September, and will be away for ten months.

There have been no staff changes during the year. The full co-operation of all members of the Branch is acknowledged.

PASTURE RESEARCH AND ECOLOGY

DR. O. WEST, *Chief Pasture Research Officer*

INTRODUCTION

In Matabeleland, the year under review began at the end of a very severe drought, with cattle generally in poor condition. At Matopos and at Nyamandhlovu experimental steers required supplementary feeding at the end of the dry season, but elsewhere conditions were not so severe and cattle wintered reasonably well. The drought year was followed by a very good rainy season and the condition of the grazing in the present dry season is very satisfactory.

The Chief Pasture Research Officer was away on sick leave from May 12th to July 31st.

THE RESEARCH STATIONS

Reports dealing with the activities of this Branch at the Matopos, Grasslands and Henderson Research Stations, at Melsetter, Tuli and Nyamandhlovu and at the Gwebi Agricultural College are included in the appropriate sections.

The effect of the drought was most marked at Matopos and at Nyamandhlovu where it was necessary to supplement most of the experimental cattle before the end of the dry season. At Tuli no supplementary feeding was necessary, but here, because the veld was unable to carry them, steers had to be removed from paddocks stocked at 1: 10 and 1 : 15 acres. At lighter stocking rates and particularly on the cleared paddocks, the animals wintered reasonably well. Both at Tuli and at Nyamandhlovu the drought stressed the great improvement in carrying capacity which results from bush-clearing.

An investigation of the value of silage made from tree leaves at Tuli and at Matopos has given very disappointing results.

At Grasslands, with the backing of the Rhizobium Laboratory, a fresh start is being made with legume introduction. Some 80 legumes comprising 25 genera were established in flats and transplanted to an introduction garden for preliminary evaluation.

In continuation of a series of management studies the residual effects of cutting and fertilizing with nitrogen on the root and shoot growth of *Sabi Panicum* was assessed. The results confirm the previous finding that frequent cutting throughout the growing season greatly reduces the vigour of *Sabi Panicum.* As compared with uncut grass, grass cut frequently has a smaller weight of roots and of carbohydrate reserves in the roots, and herbage yields in the next season are greatly reduced. Except where vigour was impaired by frequent cutting, the root weights increased with increasing quantities of applied nitrogen up to a level of 120 lb. nitrogen per acre per season. There was no further increase where 180 lb. of nitrogen was applied.

In a study of effects of defoliation on *Star Grass* no differential residual effects were found with a wide range of time and frequency-of-cutting treatments.

For the third season in succession *Sabi Panicum* grown in 3-ft. rows has yielded more herbage than that grown in broadcast stands. The increase in the past season was 30 per cent. This aspect is being further explored in another experiment, where among other things, the effect of cultivating between 3-ft. rows will be assessed.

In a study of effects of management on the yield and crude protein content of *Sabi Panicum* foggage it was found that applying nitrogen near the end of the growing season led to slightly increased yield and a higher proportion of leaf, especially green leaf, than where no nitrogen fertilizer was applied. However, the differences were small and the practice is doubtful economically. From the same study there are indications that for optimum yields of foggage leaf, *Sabi Panicum* pasture should be closed no later than late December or early January.

A maize test-crop was grown after four-year leys comprising various grasses fertilized with nitrogen at different rates. Maize yields were highest after *Bambatsi Panicum* and *Kazungula Setaria,* lowest with *Ermelo Love Grass,* and intermediate with *No. 2 Star Grass.* The rate of residual response to nitrogen was large with *Love Grass* but rather small with the other grasses. In general, yields increased steadily with increasing rates of ley-nitrogen up to the highest level tested, 189 lb. nitrogen per acre per season.

Investigations on the culture of oats-vetch short term pastures are continuing. Thirty-nine cereal varieties, mostly oats, are being compared for fodder yields. Other aspects being studied include the effect of varying seeding rates of oats and vetch, responses to nitrogen fertilizer, and the water requirements of oats pasture.

At Henderson good progress is being made in the development of forage sequences suited to the area. Here an interesting development likely to be of considerable practical importance, is the successful introduction of *Pigeon Pea* into veld grazing.

At Gwebi very interesting observations are being made on the occurrence of weeds in established plots of cultivated grasses. Of the summer grasses, *Sabi Panicum* appears to be particularly exclusive.

At Melsetter very useful progress has been made in the development of the station. The water supply to the irrigated pasture has been augmented by the building of a new dam. Other water development schemes have provided an assured supply for the 10 acres to be used for horticultural trials and have enabled the laying on of a drinking supply in the summer pasture block.

A crop of *Napier fodder* grown after *Pigeon Pea* made tremendous growth without any nitrogenous fertilizer.

In fertilizer trials on *Kikuya* pastures the value of the clover constituent, as measured by a comparison of the results obtained in two adjoining trials, one on a clovery *Kikuya* sward and one on *Kikuya* without clover, was clearly demonstrated.

500 lb. of calcium ammonium nitrate was required on the clover deficient pastures to equal the yield obtained without fertilizer nitrogen on the clovery sward.

Very encouraging results are being obtained with the new *Gulf Rye Grass* recently obtained from the United States Department of Agriculture Plant Introduction Service. In an unreplicated trial, *Gulf Rye Grass* doubled the yield of the next highest yielding variety.

PASTURE COMPETITIONS

The interest in pasture competitions is increasing. During the year competitions were held in the Beatrice, South Marandellas and Umvukwes I.C.A.s. Most of the stands entered were of a high standard and competition was keen. An interesting and very desirable development noted in the Umvukwes area, is a growing tendency to establish grass immediately after the reaping of the tobacco crop and in the same season.

PASTURE SEEDS

As is shown in the following figures supplied by the official agent to the Rhodesia Pasture Seed Growers' Association, for seed produced and sold during the season 1959–60, sales of uncertified seed continue to grow, and in the year under review they were for the first time considerably greater than sales of certified seed. In reality the difference is much greater than the figures show, because large quantities of seed, particularly of *Katambora Rhodes Grass,* are sold privately or exchanged between neighbours.

SEED GROWN AND SOLD IN SOUTHERN RHODESIA IN THE SEASON 1959–60

	Certified Seed including Foundation and Mother	Uncertified Seed	Totals
	(lb.)	(lb.)	(lb.)
Katambora Rhodes Grass	36,737	45,619	82,356
Weeping Love Grass	8,411	19,788	28,199
Giant Rhodes Grass	9,862	5,355	15,217
TOTAL	55,010	70,762	125,772

The sales of seed for irrigated pastures show a very interesting trend. The quantity of seed of *Bromus, Cocksfoot, Fescue* or *Rye Grass* and *Clover* has decreased by half to approximately 10,374 lb. since last year, while *Lucerne* and *Hairy Vetch* sales show steep increases.

These figures reflect the growing popularity of irrigated lucerne and the marked drift away from conventional grass-clover pastures to the use of oats and vetch for the provision of winter keep for dairy cows. This is closely tied up with, and largely a result of, the work in progress with irrigated pastures on the Grasslands station.

It is disappointing to note that no seed of *Bambatsi Panicum, Kazangula Setaria* or *Cenchrus ciliaris* was produced for sale. These are all useful species and it is anticipated that their popularity will revive. Encouraging is the interest being shown in *Sabi Panicum* of which a limited amount of seed was produced for sale.

PASTURE PLANT INTRODUCTION

Much interesting material including both legumes and grasses, collected during the year by the C.P.R.O. in Kenya, Tanganyika and in the Federation, is being bulked up for trial in the nursery at Grasslands.

In collaboration with Mr. Ducker, a collection of perennial *Arachis* species and varieties is being assembled at Henderson. Some of these are vigorous plants and show promise as potential pasture legumes.

Collections of seeds of pasture species have been obtained from the governments and institutions in Kenya, Tanganyika, the Republic of South Africa and elsewhere, while numerous requests from other countries have been complied with.

ECOLOGICAL AND LAND-USE SURVEYS

Assistance to officers of the Department of Conservation and Extension in studying the ecology of their areas has been continued and tours were made in several I.C.A.s.

A working party, of which the C.P.R.O. was chairman, surveyed and reported on the ranching potential of the Chambesi Flats in the Northern Province of Northern Rhodesia. The C.P.R.O. assisted the Department of Native Agriculture in a reconnaissance survey of the Western Lowveld at the end of the drought.

An interesting and extended tour of research stations and bush-clearing operations was made in Kenya and Tanganyika.

Regular visits were paid to the research stations.

SARCCUS BUSH ENCROACHMENT SURVEY

At the meeting of SARCCUS held in Nyasaland in April/May, 1960, it was decided to appoint a sub-committee of one member, Dr. O. West, to investigate the importance of bush encroachment in the various territories of Southern Africa, the progress made, the solution in each case and the possibility of establishing a co-ordinated research programme in this respect.

The work of the committee has been handicapped by the C.P.R.O.s illness and the lack of assistant staff. However, in reply to a questionnaire which was circulated to member governments, a great mass of information has been assembled and this is being analysed as opportunity offers. It is unfortunate that the pressure of other duties has been such that the C.P.R.O. has not been able to devote much time to this survey nor has he been able as yet to visit any of the member territories.

COMMITTEES, CONFERENCES AND MEETINGS

The C.P.R.O. served on the following committees:

Bush Encroachment Sub-committee of SARCCUS.

Southern Rhodesia Research Advisory Committee.

Federal Hydrological Co-ordinating Committee.

The Native Affairs Committee of the Natural Resources Board.

The Tsetse and Trypanosomiasis Committee (representing the Director of Research and Specialist Services).

The Salvinia Sub-committee of the Kariba Co-ordinating Committee.

The Wild Life Research Advisory Committee of the Southern Rhodesia Department of Wild Life Conservation.

Working Party on the Chambesi Flats Ranching Scheme.

Working Party on Livestock Production and Grazing Management to the Advisory Committee on African Agricultural Production.

The Melsetter Pasture Station Liaison Committee.

The Technical Advisory Committee to the Rhodesia Pasture Seed Growers' Association.

During the year he attended and spoke at a number of meetings of Farmers' Associations, Intensive Conservation Area Committees, Field Days, Regional Conferences and courses for Conservation Officers. He read a paper at the Professional Officers' Conference of this Department and attended the Conference on Land Management Problems in areas containing game at Lake Manyara in Tanganyika.

REPORTS

by

DR. WEST

"Milk Production from Irrigated Pastures."

"The Role of Pasture in Farming Systems", Fifth Annual Conference of Professional Officers.

"The Chambesi Flats Ranching Scheme. Report of the Working Party from the Federal Ministry of Agriculture."

"Report on a Visit to Kenya and Tanganyika in February/March, 1961."

BRANCH OF BOTANY, PLANT PATHOLOGY AND SEED SERVICES

DR. G. R. BATES, *Chief Botanist and Plant Pathologist*

INTRODUCTION

THE STRUCTURE of the Branch with its three component sections concerned respectively with botany, plant pathology and seed services was maintained. Difficulties were experienced in recruiting staff and certain professional posts, established in July 1960, remain unfilled. The resignation of Mr. J. B. Phipps, grass taxonomist, at the end of August 1961, was a serious loss to the Herbarium. A new post of Weed Research Officer was authorized in July 1961, but a suitable candidate has still to be found. Dr. H. Wild took charge of the Branch on several occasions when Dr. G. R. Bates was on leave or was acting as Assistant Director of Research and Specialist Services.

The regional plant pathology laboratory opened at Umtali last year, with Dr. J. O. Whiteside in charge, has proved a most successful innovation.

New equipment and facilities provided during the year include a Hirst Volumetric Spore Trap to assist in the wheat rust investigations and two new germination rooms with ancilliary services for the seed-testing section. This building has been completed and only requires the installation of air-conditioning apparatus for it to be put into operation.

Full use was made of the advisory, identification and testing facilities of the Branch by farmers and the general public. As has been the case in recent years, the demands made for such services have been so heavy that our research activities have necessarily had to be curtailed. The dangers of this situation are realized but until more research staff can be recruited the problem will remain.

Good progress was made with the long-term *Flora Zambesiaca* project and the second part of Volume 1 appeared in April 1961. The same month saw the publication of the first complete volume of *Kirkia,* the official journal of the Federal Herbarium. The Senior Botanist and his staff gave active assistance to the problems arising from the fantastic development of *Salvinia auriculata* on Lake Kariba. Co-operative investigations on the survey of indigenous poisonous and medicinal plants were continued.

Virus diseases of field and horticultural crops were a prominent feature of the year under review. Serious outbreaks occurred on tobacco and tomato whilst more kromnek virus was discovered among dahlias and garden ornamentals than for many years past. With the improved facilities available, more work was possible on wheat stem rust. Investigations on deciduous fruit diseases in the Eastern Districts were considerably extended.

The Seed Services section had to deal with an unexpected influx of samples, the number of which increased out of all proportion to the anticipated expansion of the industry. This lead to unavoidable delays in the submission of reports and a regrettable increase in the back-log of samples awaiting test.

Greater attention was paid to the legislative aspects of seed marketing following the appointment of an inspector for this purpose. During the year it was decided by the Ministry to confine all official seed-crop inspections to members of recognized associations. The Officer-in-Charge, Seed Services, drew up a complete revision of the Seed Regulations, incorporating improvements and changes based on the experience gained over the past eight years. Assistance provided by the Danish Government enabled Mr. K. A. Hanssen, one of our seed officers, to attend a Seed Certification Course in Denmark whilst on overseas leave.

The usual courses of lectures on plant pathology and on seed testing, production and certification were given at the Gwebi College of Agriculture. Another short course on seed testing and production was provided to students of the Department of Agriculture, University College of Rhodesia and Nyasaland. Addresses were delivered to several meetings of farmers' associations and other organizations concerned with agriculture and horticulture. Instructional talks were given to courses arranged by the Department of Conservation and Extension and by the Native Agriculture Department. The central theme of the Ministry's exhibit at the annual Salisbury Agricultural Show concerned "seed" and was largely organized by the Seed Services section of the Branch.

It is pleasing to record our appreciation of the collaboration and assistance received from other branches and research stations of this department and for the valued co-operation with the Department of Conservation and Extension.

In addition to the botanical contributions referred to above, two scientific papers were published by members of the Branch in the *Rhodesia Agricultural Journal* and one in an overseas journal in the course of the year. The vegetation map of the Federation by J. M. Rattray and H. Wild also became available. Cyclostyled pamphlets were prepared and distributed on diseases of deciduous fruit and vegetables. Articles and notes were contributed to local farming journals and to the daily press.

BOTANY

Herbarium

The total number of accessions during the year was 13,005, a decline of 1,088 compared with the previous year. Approximately half the specimens received were for naming and the remainder consisted of duplicates from other herbaria in Africa, Europe and America. Much of the local material was supplied by Government departments from all three territories of the Federation. Substantial collections were also received from the Agricultural Department of the Bechuanaland Protectorate and from the University College of Rhodesia and Nyasaland.

The following genera and families were sent on loan for specialist study: *Celastraceae* to Dr. Robson, Kew; *Utricularia* to Mr. Taylor, Kew; *Asplenium* to Dr. Schelpe, Cape Town; *Selaginella* to Dr. Reed, Baltimore, and *Chailletiaceae, Olacaceae, Opiliaceae, Icacinaceae* and *Aquifoliaceae* to Professor Fernandes, Coimbra.

Botanical collecting expeditions were restricted by staff shortages but useful material was obtained by our botanists from the Bubye and Limpopo junction area (Dr. Wild), Nuanetsi (Drummond) and the Northern Province of Northern Rhodesia (Phipps, in collaboration with the International Red Locust Control Service).

Satisfactory progress continued to be made with the *Flora Zambesiaca.* Work on the *Vitaceae* for Volume 2, Part 1, was completed and a start made on the *Rhamnaceae.* Volume 1, Part 2, containing ten families, was published in April 1961. Galley proofs of Volume 2, Part 1, have been corrected and its publication is expected early in 1962. The manuscript of the *Arundinelleae* for the grass volume of the *Flora* was completed by Mr. Phipps before he left the Branch. His resignation is a serious loss and the accurate naming of grasses will be difficult until this specialist post can be filled.

The first complete volume of *Kirkia,* the official botanical journal of the Federal Herbarium, was published in April 1961. Its appearance was warmly welcomed in international botanical circles and the reviews were most encouraging. It has also served to swell our library accessions to the extent of some twenty-five botanical journals from all parts of the world through its acceptance as a regular exchange medium. Volume 2 of *Kirkia,* which maintains the standard set by the first volume, is now in the hands of the printer and should be published before the end of the year.

Botanic Garden

Although no major development was possible during the year under review, it is pleasing to report a more generous allocation of funds has now been made by Government which, with the recent appointment of a well-qualified Curator, should enable an active start to be made in the near future on this important project. The handsome contributions made by many donors to the privately sponsored National Botanic Gardens Fund will also now be put to useful purpose in providing the desired facilities necessary to build up a first-class botanical garden.

Economic Botany

Weeds. As part of the reorganization of the field inspectorate services of this Department, the Field Assistant, hitherto employed by this Branch on weed inspection and control services, was transferred to the Department of Conservation and Extension in June 1961. Prior to his transfer, this officer spent some months supervising the manual eradication of *Salvinia auriculata* from a number of dams and streams in the Odzi and Tsungwezi Intensive Conservation Areas. Satisfactory clearance of this aquatic pest was obtained but the area will have to be carefully watched for reinfestations.

A new post of Weed Research Officer was recently created in this Branch and strenuous efforts are being made to recruit a suitable person. The establishment of this specialist post is welcomed in view of the increasing appreciation of the importance of modern weed control methods in agriculture as well as the numerous

problems posed by certain aggressive and noxious weeds in the Federation. Of these, the enormous infestation of the aquatic fern, *Salvinia auriculata,* on Lake Kariba remains the dominant problem and our botanists have continued to assist the Kariba Lake Co-ordinating Committee in its efforts to deal with this prolific weed. Two aerial surveys were conducted by one of our botanists during the year of the Lake Kariba infestation; the most recent of these indicates a considerable slowing down the rate of expansion of the overall *Salvinia* infestation. Whether this can be ascribed to a lowering of nutrient levels in the lake or to increased wave action, or to other factors, is a matter for further investigation.

During the period under review *Salvinia auriculata* was proclaimed a noxious weed in Southern Rhodesia whilst *Eichhornia crassipes* (water hyacinth) and *Lantana camara* were similarly proclaimed in Northern Rhodesia, the latter in the line-of-rail districts only. The position of *L. camara* as a potential noxious weed is under active consideration in Southern Rhodesia.

The task undertaken by Dr. H. Wild at the request of CCTA/CSA to prepare a handbook on *Harmful Aquatic Plants in Africa and Madagascar* has been completed. By arrangement with the sponsors it will be printed in our official journal, *Kirkia,* and separates for distribution supplied to the CCTA/CSA secretariat. The handbook deals with 54 species of aquatic plants classified according to their immediate and potential importance. Species occurring in other parts of the world which might be introduced into Africa are also described. The publication is fully illustrated and also contains notes on the distribution and eradication methods advised for each species.

Poisonous Plants. Investigations on plants poisonous to stock were continued in co-operation with the Department of Veterinary Research. *Cyphostemma humile* and *Polygala sphenoptera* from the Great Dyke region of Southern Rhodesia were found to contain selenium in toxic amounts. *Gerberia discolor* and *Ipomoea obscura* were discovered to contain prussic acid whilst the following plants were also shown to be poisonous: *Nicotiana glauca, Moraea erici-rosenii, Senecio sceleratus, Combretum platypetalum* (fruits) and *Amanita vittadinii* (fungus).

Medicinal Plants. The joint survey, with representatives of an American pharmaceutical manufacturer, of alkaloid-bearing plant species was continued. Some 1,200 plants have now been named prior to analysis. Only a fraction of the local flora has been covered in this work and many alkaloids of potential medicinal value probably await discovery. Assistance was again given to various firms and individuals interested in the possibilities of cultivating *Dioscorea* species for the production of *diosgenin,* a precursor of the steroid hormone, cortisone.

General

Numerous botanists from other research institutions in Africa and overseas visited the herbarium in the course of the year.

Publications

1. *Kirkia,* Vol. 1, ed. H. Wild, April, 1961. Govt. Printer, Salisbury.
2. *Flora Zambesiaca,* Vol. 1, part 2, eds. A. W. Exell and H. Wild, Crown Agents for Overseas Govts. and Administrations (published 14th April, 1961).
3. Vegetation Map of Federation of Rhodesia and Nyasaland, by J. M. Rattray and H. Wild. Federal Atlas, Map No. 10. Federal Surveys (with a descriptive explanation of the map shortly to be published in *Kirkia*).

PLANT PATHOLOGY

Advisory

The opening of a regional plant pathology laboratory in Umtali last year proved a most successful innovation, permitting, as it has, the more expeditious handling of inquiries from the Eastern Districts whilst facilitating investigations on important deciduous fruit and vegetable disease problems. Studies have also been commenced on the incidence and distribution of diseases of forestry plantations. The advisory and field services centred in Salisbury were also actively occupied throughout the year.

The season proved exceptionally favourable for most crops and, with a few exceptions, no serious losses from disease were experienced. Virus diseases were more prevalent than usual, especially on tomatoes, tobacco and potatoes.

The number of specimens received for examination by the two laboratories rose by more than 50 per cent. over the previous year to the record total of 910, which embraced 60 new disease or host records. Among these the following are of special interest:

Apple scab due to *Venturia inaequalis* (Cke.) Wint.; leaf blight of strawberry due to *Dendrophoma obscurans* (Ell. & Ev.) H. W. Anderson; needle blight of *Pinus radiata* due to *Actinothyrium marginatum* Sacc. wilt and stem-break of *Crotalaria ochraleuca* due respectively to *Fusarium oxysporum* Schleckt. ex Fr., and *Colletotrichum capsici* (Syd.) Butler and Bisby (incidentally the latter fungus was also recorded for the first time on *Capsicum* sp.); grey ear-rot of maize due to *Physalospora zeae* Stout (conidial stage only); and petal blight of dahlia due to *Pseudomonas fluorescens* Mig. The host range of the widely distributed root rotting fungus *Armillaria mellea* (Fr.) Quel., was extended to include coffee, black wattle *(Acacia mearnssii)*, *Pinus elliottii, P. patula* and *Brachystegia boehmii.*

Several hyperparasites were recorded including a bacterial parasite, *Erwinia uredovorus* (Pon.) Hayward and Hodgkiss attacking the wheat rust fungus *Puccinia graminis tritici; Eudarluca australis* Speg. parasitizing rusts of sorghum *(Puccinia purpurea)* and iris *(P. iridis),* and a species of *Cicinnobolus* attacking mildew *(Oidium* sp.) of pawpaw.

Tobacco. Fewer specimens than usual were received, especially of seedlings, where most of the troubles were associated with spray injury, fertilizer burn or excessive alkalinity. Occasional instances of anthracnose and wildfire were recorded. Persistent rainfall during January and February was accompanied by localized outbreaks of the bacterial diseases angular spot and hollow stalk (*Erwinia carotovora).* The related virus diseases, rosette and bushy top, both of which are transmitted by aphids, developed extensively in late planted Virginia flue-cured and most Turkish crops causing severe losses in many cases. Diseases recorded in plantings of cigar type tobacco, a crop in which revived interest is being shown, included wildfire and the viruses mosaic, leaf curl, rosette and bushy top.

Potato. Encouraged by a sequence of fairly late-blight-free years many growers reverted to the susceptible Up-to-Date variety for main crop planting with, during the season under review, unfortunate results. Substantial losses from this disease were sustained in both summer and first irrigation crops. Early blight was also damaging to summer crops in Mashonaland and the Eastern Districts. The first record of black-leg persisting in locally produced seed tubers was discovered in a crop from the Eastern Districts but the amount of infection was extremely low. Very severe black-leg developed in first irrigation crops grown from newly imported Scotch seed. Virus Y was more prevalent than usual in the summer crop. Several instances of bacterial wilt were recorded, one of which was traced to the use of infected seed tubers.

Maize. Streak virus continued to be serious in early maize plantings grown with irrigation for fodder purposes or for the "green mealie" trade. Growers who kept their lands free from weed grasses had appreciably less streak infection. With one exception, streak virus did not extend into subsequent main crop plantings in the highveld region. On the other hand the disease was widespread in summer maize crops, including sweet-corn, in several parts of the Eastern Districts. Winter wheat plantings in the same region were also attacked by the virus.

Cob-rotting diseases were more in evidence than for the previous two seasons. Grey ear-rot, due to the fungus *Physalospora zeae,* was discovered for the first time in Southern Rhodesia attacking hybrid maize at Gatooma.

A recently released hybrid variety showed up badly when exposed to wet conditions during early growth. Some young plants were attacked by *Colletotrichum graminicola* and others killed by *Sclerotium rolfsii,* the first local record of this pathogen on maize. A severe but localized outbreak of head smut (*Sphacelotheca reiliana)* developed on one farm in the Salisbury district.

Cereal Crops. An increase in sorghum acreage focussed more attention on diseases affecting this crop. Rust due to *Puccinia purpurea* was identified for the first time and downy mildew *(Sclerospora sorghi),* although previously recorded, had not been found to cause the serious damage observed this year to crops at Gatooma, Gwelo and Bulawayo. Sooty stripe due to *Ramulispora sorghi* was reported to be serious on sorghum plantings in the Shangani district.

Early plantings of oats at Fort Victoria were heavily attacked by crown rust. Unusually high temperatures during April and May were linked with yield losses of early planted barley at Odzi and Cashel, where the crops were stunted and

chlorotic. Later plantings made normal growth. Stem rust was prevalent on both summer and winter wheat crops.

Green Manure Crops. Wilted plants in an experimental plot of *Crotalaria ochraleuca* were infected with *Fusarium oxysporum.* Stem lesions on the same crop were caused by *Colletotrichum capsici.* Root- and vine-rot *(Phytophthora dreschleri)* of velvet bean was recorded from Fort Victoria and Bulawayo. No reports of serious damage due to this disease were received.

Vegetables. When first discovered in the Salisbury area towards the end of September 1960, bacterial canker of tomato *(Corynebacterium michiganense)* appeared to be confined to a few plantings and efforts were therefore made to eradicate the disease. It was subsequently found to be far more widely distributed than originally supposed and any general eradication campaign was obviously impracticable. The damage caused varied considerably but some growers reported losses of between 50 and 60 per cent. The origin of this widespread outbreak has not been satisfactorily explained and it seems possible that the disease had been present for some time before discovery, but was overlooked by growers.

Another damaging tomato disease followed hard on the heels of bacterial canker. The second disease which caused severe stunting accompanied, in severe cases, by distortion of the fruits appeared suddenly in widely separated districts. It proved to be a severe strain of the tobacco mosaic virus and, once identified, was soon checked by suitable control measures.

In the Eastern Districts early plantings of french beans suffered severely from pre-emergence damping-off and to a root-rot caused by *Rhizoctonia solani.* Halo blight occurred mainly in crops grown during heavy rains or with overhead irrigation. Rust again destroyed plantings of the susceptible variety Double Dutch Princess and in the lowveld a progressive increase in the amount of this disease was noted on bean seed crops over the period April to June. Ashy stem blight was troublesome in some areas on beans receiving overhead watering.

By restricting planting to the April-May period pea growers have learned to avoid serious losses from powdery mildew. Ascochyta blight was prevalent at Chipinga especially among peas grown with overhead irrigation. Fusarium wilt of peas developed in localized areas and was invariably associated with impeded drainage.

Black rot of melon due to *Mycosphaerella citrullina* was recorded for the first time at Beatrice and Bulawayo. Purple patch of onion was commonly reported and often caused serious losses among young seedlings.

Coffee. The "hot and cold" disease previously reported again developed in many Eastern Districts coffee plantings. Unless satisfactory control measures are found this disorder might well prove a limiting factor in the successful production of coffee. Zinc deficiency responded well to zinc oxysulphate treatment. Berry blotch *(Cercospora coffeicola)* caused damage in the Chipinga district.

Fusarium die-back of coffee bushes was noted to be related to the stump method of planting wherein the nursery stock is severely pruned before transplanting.

Deciduous Fruit. Apple scab *(Venturia inaequalis)* was discovered for the first time in Southern Rhodesia during November 1960, at Melsetter on eight-year-old trees of the White Winter Pearmain variety. Other varieties in the vicinity were not infected. The disease was later found on apple trees in two private gardens in Salisbury.

Mildew was troublesome on susceptible apple varieties especially Rome Beauty and Winter Banana. Bitter-rot occurred in orchards situated in the higher rainfall belt, White Winter Pearmain being particularly susceptible.

On stone fruits leaf curl *(Taphrina deformans)* was serious in wet regions whilst scab *(Cladosporium carpophilum)* and rust attacked peaches and apricots, the latter disease, in addition to causing premature defoliation, also damaged the fruit in some orchards. Mildew was not generally serious but caused occasional losses among peaches and nectarines.

Flowers. Kromnek *(Lycopersicum* virus 3) was again troublesome and several outbreaks were discovered in private gardens both at Bulawayo and Salisbury. All were associated with typical virus infection in dahlias. The presence of infection in young seedling dahlias indicated the occurrence of an active vector. Rigorous eradication and destruction of all infected hosts was undertaken. Other hosts of the

virus observed included *Capsicum* sp., *Viola odorata, Physalis peruviana, Dimorphotheca sinuata* and *Ammi majus* var. *glaucifolium.*

Serious losses from diseases caused by *Fusarium oxysporum* v. *gladioli, Sclerotinia gladioli* and *Bacterium marginatum* were suffered by several gladiolus growers who planted imported corms. Rust was commonly reported on this host.

Iris rust was recorded for only the second time. Carnations were frequently attacked by Fusarium wilt and outbreaks of leaf spot due to *Alternaria dianthi* occurred in Bulawayo and Salisbury.

Forestry. Young plantations of *Pinus radiata* in Nyasaland developed severe needle-cast symptoms associated with infection by the following fungi: *Actinothyrium marginatum* Sacc.; *Pestalotia caffra* Syd., and *Pestalotiopsis royenae* (Guba) Stey.

Another new mycological record was *Mycosphaerella moelleriana* (Theum.) Lindau causing a leaf spot of *Eucalyptus maidenii.*

Disease surveys of pine plantations were conducted in the Eastern Districts. Armillaria root-rot was only found to be important in restricted areas at Melsetter and Mount Selinda, *Pinus elliottii* being more susceptible to the disease than *P. patula.* The only indigenous trees commonly attacked by Armillaria were species of *Brachystegia.*

RESEARCH

Although short-term studies were made on several disease problems encountered in the course of the period under review our main attention was again directed towards the problem of wheat stem rust and methods for controlling certain deciduous fruit diseases.

Wheat. Improved facilities in the shape of a plant growth chamber, in which environmental conditions can be reasonably accurately controlled, have greatly assisted in the identification of wheat stem rust races. We have also acquired a Hirst Volumetric Spore Trap which though primarily intended for studying the epidemiology of stem rust will help our investigations into other important crop diseases.

Results already obtained in the growth chamber have revealed deficiencies in the standard differential wheat varieties used for rust race typing. Additional local wheat varieties are therefore being tested as differentials in an attempt to overcome this difficulty and, at the same time, to more closely relate our rust survey studies with the wheat breeding programme.

Stem rust was prevalent in the summer crop at the Salisbury Experiment Station and permitted good screening of breeding material for resistance. The disease was also severe in the winter plantings of commercial growers. In the winter variety trials at Henderson and Sabi, a high degree of stem rust resistance was exhibited by the varieties F.406, F.407, H.7A1 and S.10. A considerable amount of resistance to our existing races of stem rust was detected in the 547 entries included in the current International Spring Wheat Rust Nursery.

In routine field collections from growers' crops, race 21 was again predominant although it is probable that two, if not more, biotypes are included within this race. Race 34 was identified from a few collections.

Deciduous Fruit. In a comparative spray trial against mildew on Rome Beauty apple trees, colloidal sulphur at 0.3 per cent. gave superior results to 0.1 per cent. Karathane. Trials for controlling bitter-rot of apples were continued using several organic fungicides. Only Maneb and Captan both at 0.15 per cent. significantly reduced the amount of bitter-rot under the conditions of this experiment. Glyodin at 2 pints/100 gallons was the least effective of the fungicides used. All fungicides gave effective control of sooty blotch.

Laboratory studies confirmed that the bitter-rot fungus can over-winter on dead, fallen leaves. It was also found that the incubation period for bitter-rot decreased as the fruit matured.

Two orchard trials were conducted with a range of organic and copper fungicides to control peach rust. Both copper oxychloride and bordeaux mixture proved unsuitable due to severe phytotoxicity, the former causing more damage than the latter. Zineb and Maneb gave outstandingly the best control when used at 0.2 per cent. strength, Zineb being preferred for practical application because of the widespread occurrence of zinc deficiency in Eastern Districts orchards.

PUBLICATIONS

1. Notes on Plant Diseases in Southern Rhodesia, by G. R. Bates, *Commonwealth Phytopath. News,* vol. 7, pp. 46-47, 1961.
2. Bitter-rot of Apples and its Control in Southern Rhodesia, by J. O. Whiteside, *R.A.J.,* vol. 58, July–Aug. 1961.

SEED SERVICES

The appointment of two or more technical assistants for laboratory and seed inspectorate duties respectively provided a temporary respite to the heavy demands made upon the staff of this section. Unfortunately the seed inspector resigned after some ten months service and, at the time of writing, no suitable replacement has been found. Visitors to the laboratory present a further problem, the number having more than doubled, with more than 900 calling during the period under review.

Our international commitments also increased with the participation of this Ministry in the F.A.O. World Seed Year programme. Contributions to this important project included a comprehensive exhibit on seed at the annual Salisbury Agricultural Show and much technical assistance by the professional staff of the section towards the preparation of a documentary film entitled "Seeds for Tomorrow". This film covers most facets of the seed industry in the Federation and is due for release in December 1961.

Some 21 referee samples were received from the International Seed Testing Association for comprehensive examination and test.

LABORATORY

The number of samples received for examination rose steeply to 2,236, representing an increase of more than 75 per cent. over the previous year's intake. Various factors in addition to normal expansion conspired to bring about this sudden increase which, being quite unexpected, led to unavoidable delays in the submission of test reports and a regrettable build-up in the back-log of samples awaiting examination. Germination tests also increased sharply to the record total of 4,565. In addition, 61 special disease tests were conducted over and above the routine examinations carried out for the presence of disease in commercially produced seed. 247 phytosanitary certificates and three Orange International certificates were issued. 169 specimens were submitted for identification and another seven lots of seed for dodder examination.

Two hundred and fifty-three, or 12.8 per cent. of the total samples received for purity and germination testing, failed to reach the prescribed minimum standards.

The seed inspector visited 231 merchants selling seed and drew 220 samples for check testing. Substantial amounts of incorrectly marked or aged seed were condemned.

The high standards required for certified maize seed were well maintained, the average precentage germination of hybrid varieties being even better than in the previous year. Whilst a greater proportion than usual of maize samples showed infection by *Diplodia zeae,* the percentage infection was lower. Very little infection by *Fusarium graminearum* and *Colletotrichum graminicola* was recorded.

SEED PRODUCTION

As a result of discussions with representatives of both seed growers and the trade it was decided that from 1961, official inspection and certification of seed crops would be confined to members of recognized seed associations. All field inspections of pasture grass, tobacco, vegetable and flower seed, and potato crops registered under the certification schemes of the four seed associations concerned were conducted by officers of this Branch. During the year some 5,815 acres of seed crops were produced by 393 registered growers, the inspection of which required more than 400 visits throughout Southern and Northern Rhodesia. A total of $3\frac{1}{2}$ million pounds weight of certified seed was produced, $1\frac{1}{2}$ million pounds being seed potatoes.

Grasses. Better seasonal conditions during the period under review are reflected in the estimated production of 178,000 lb. of certified seed which is three times the amount produced last year. The two Rhodes grasses, Katambora and Giant, account for the major part of the crop. A new classification system based on pure live-seed content and weed content was introduced for the Rhodes grasses and the Ermelo strain of Weeping Love grass. A modified germination technique,

based on the use of tetrazolium chloride, was developed in the laboratory for use with Rhodes and Weeping Love grasses. Further studies on Sabi Panicum *(P. maximum)* seed failed to reveal any reliable procedure for breaking the pronounced dormancy shown by freshly harvested seed.

Vegetable and Flower Seed. The swing from pea- to bean-seed production noted last year continued with a further decline in the area planted to the former crop from 1,276 to 648 acres. Bean plantings rose from 817 to 1,004 acres. Lettuce continued to be popular, 55 acres of seed crops being registered.

Smaller acreages of broad bean, vegetable marrow, radish and various flower-seed crops were also grown. The total acreage planted to vegetable- and flower-seed crops dropped from 2,150 in 1959-60 to approximately 1,720 in 1960-61.

Pea seed yields were again disappointing. Unusually high temperatures during April-May were accompanied by severe attacks of powdery mildew. Ascochyta blight was prevalent among crops grown with spray irrigation. Rust was a serious problem on certain white seeded varieties of beans whilst eelworm and stem maggot proved limiting factors to the successful production of bean seed in certain lowveld districts.

Potatoes. 375 acres of seed-potato crops were registered for certification, of which 18 acres were rejected and a further 10 acres downgraded. More than 20,000 standard pockets of "A" and "B" grade seed tubers were inspected, some 2 per cent. being rejected due to excessive decay and eelworm. The late-blight susceptible variety Up-to-Date accounted for 80 per cent. of the seed crop which, in view of the losses experienced from this disease in the summer and first irrigation plantings, explains, in part, the periodic shortages of ware potatoes this year.

Tobacco. Production of certified seed at 2,500 lb., although only half that of the previous year, was more than sufficient, together with accumulated reserve stocks, to supply the needs of the industry. Some 312 lb. of the present crop consisted of Turkish varieties. Although five crops failed to satisfy the required standards none were rejected on account of disease. It is estimated that 87 per cent. of the 1961–62 tobacco crop in Northern and Southern Rhodesia will be grown from certified seed.

Most of the problems connected with tobacco seed production have now been satisfactorily overcome but new difficulties have arisen with regard to seed storage and the establishment of a seed "bank" sufficient to provide at least one year's supply for the industry. Urgent attention is being given to this problem.

Approval Schemes

(a) *Wheat.* 547 acres of wheat seed crops were inspected under the approval scheme. Experience now gained indicates the desirability of inaugurating a comprehensive certification scheme in the near future.

(b) *Groundnuts.* 96 acres of the main varieties currently in demand were inspected for use as approved seed stocks. Preliminary trials were conducted to determine the influence of time of lifting on seed quality. Results were inconclusive but groundnuts lifted early showed a lower incidence of mould attack in the germinator. It was also observed that all varieties exhibited a high degree of dormancy which was associated with the moisture content of the seed.

(c) *Soybeans.* 205 acres of both grain and fodder varieties were inspected for seed purposes. Difficulties were met in distinguishing varietal differences and a greater knowledge of these will be necessary before any satisfactory approval or certification scheme can be introduced.

Investigations

In continued experiments with the silver nitrate treatment of Virginia type tobacco seed, concentrations of 0.25 per cent. and upwards, applied for periods of 15 and 30 minutes, led to the development of phytotoxic symptoms among seedlings both in laboratory and greenhouse tests. Further experiments using a closer range of silver nitrate concentrations are planned.

Assessments of the two new maize trials at the Gatooma Research Station, designed to examine the effects of fertility, cultural operations and rotations on the development of cob and stalk rots, were made for the second time. The early results tend to confirm previous observations regarding the depressing influence of adequate nitrogen upon the incidence of *Diplodia* cob-rot and its concomitant

effect in leading to a higher incidence of stalk borer attack with a corresponding increase in *Fusarium moniliforme.*

The research programme on problems of seed production in horticultural crops was expanded and field trials established at the Henderson, Grasslands and Sabi Valley research stations.

PUBLICATIONS

1. Production of Grass Seed for Certification, by W. E. Kerr, *Rhod. Agric. J.*, vol. 58, March-April 1961.

GENERAL

The Branch was represented on numerous departmental and other committees including the technical committees attached to each of the four Seed Grower's Associations for which official inspection facilities are provided.

During a period of leave in England the Chief Botanist and Plant Pathological paid official visits to the East Malling Research Station, the Rothamsted Experiment Station and the Plant Pathology Laboratory, Harpenden. As a member of the Scientific Council for Africa (C.S.A.), he attended its twelfth annual meeting held in Pointe Noire, Congo (Brazzaville) during August 1961. Dr. Bates continued to hold the post of Liaison Officer for the Commonwealth Agricultural Bureaux in the Federation.

Dr. H. Wild visited Pretoria in October 1960 for consultations with the Division of Botany on botanical matters and to work in the National Herbarium.

THE CHEMISTRY BRANCH

DR. H. WEINMANN, *Chief Agricultural Chemist*

A CONSIDERABLE NUMBER of staff changes occurred during the year. Three professional officers left on resignation and two of the vacancies thus created remained unfilled throughout the year, although it has been possible to employ two temporary technical assistants in place of professional officers for part of the year. Dr. L. Jacklitsch joined the Branch as a pedologist, seconded to the Department of Conservation and Extension in Northern Rhodesia. Mr. B. D. Soane, soil physicist, was transferred from the Sabi Valley Experiment Station to the Salisbury Laboratories in November 1960. At the beginning of 1961, Mr. E. Griffiths was seconded to the Department of Conservation and Extension as the third pedologist, to assist with the land classification aspects of farm planning, and Mr. A. Geissler, a technical assistant, was seconded to the Matopos Research Station in August 1961 to take charge of the newly established chemical laboratory there, after having worked for four months in the laboratory at the Henderson Research Station. Three technical assistants left on resignation and were subsequently replaced.

Mr. D. G. Bushnell, Officer-in-Charge of the General Section, spent four months of the year in the United States of America studying biochemical techniques in the field of animal nutrition under the auspices of the International Coöperation Administration. Mr. D. P. Thornhill was awarded a Commonwealth Scholarship, as the result of which he left in December 1960 on two-year's study leave in Canada.

In spite of the disturbing effect of these staff changes, the total output of the Branch for the year was comparable to that of previous years. The total number of samples analysed and reported upon is given in Table I (together with the corresponding figures for 1959–60), but does not include samples analysed by the Research and Soil Survey Sections, the work of which cannot be expressed in such terms.

TABLE I

NUMBER OF SAMPLES ANALYSED

	1960–61	1959–60
General Section	3,578	4,012
Soil Testing Section:		
Advisory	3,715	3,631
Investigatory	1,294	759
TOTAL	8,587	8,402

While the number of samples analysed in the General Section showed a decrease of 434, or 11 per cent., as compared with the previous year, the number of samples analysed in the Soil Testing Section increased by 619, i.e. 14 per cent., and the total number of samples analysed and reported upon in 1960–61 was slightly higher than the total for 1959–60. Detailed reports of the individual sections are given below but certain important aspects deserve special mention.

Of the 3,578 samples analysed by the General Section, 3,299 samples (92 per cent.) were submitted by various Government departments. This figure includes 1,949 samples (mostly vegetable products, feeds and faeces) from the various research stations, including Gwebi Agricultural College, 830 samples (mainly toxicological specimens and blood samples) from the Veterinary Department, 64 samples (mainly waters) from the Southern Rhodesia Department of Native Agriculture and 44 water samples from the Hydrological Branch of the Southern Rhodesia Division of Irrigation and Lands. While the number of samples analysed in the General Section for Government departments showed a slight increase as against last year's figure (3,175), those from private firms and individuals decreased from 837 in 1959–60 to 279 in 1960–61. Thus, while the increased demand for analytical work for Government departments, and particularly the research stations, commented upon in last year's report, continues, analytical work for private individuals and firms has definitely declined; it would appear that such work has now largely been taken over by private consultants.

It is recognized that a good deal of the routine analytical work required by the research stations can, with advantage, be carried out at the stations by suitably qualified seconded technical assistants working under the guidance and supervision of the professional staff of the Branch. Such arrangements are now in existence at both the Grasslands and Matopos Research Stations, and it is hoped that it will be possible, in the not too distant future, to second a technical assistant also to the Henderson Research Station. This would appear to be particularly important in view of the fact that certain biochemical work in the field of animal nutrition is planned at that station, involving the analysis of perishable materials.

Under the provisions of the Fertilizers, Farm Feeds, Seeds and Remedies Act, 1952, 161 samples of fertilizers, farm feeds and cattle dips have been taken and analysed during the year. Apart from this, inspections of feed manufacturers' premises and stocks in Bulawayo and Umtali were carried out by the British South Africa Police at the request of this Branch. Only some minor infringements of the regulations had to be dealt with.

Regulations controlling the registration, sale, official sampling and analysis of agricultural liming materials came into force in March 1961. These regulations appear to have been accepted well by the trade and the farming community and should ensure that, in future, only agricultural liming materials of suitable quality will be offered to farmers. In this connection, it should be mentioned that during the year new and better procedures for testing soil acidity and determining the lime requirements of soil have been introduced in the Soil Testing Section, and several articles on the use of lime and related matters have been published by members of the staff.

In the Soil Testing Section, 5,009 soil samples have been analysed and reported upon during the year, and while the demand by practical farmers for soil testing services continues to increase slowly, the proportion of soil samples examined for investigatory purposes was higher than in previous years, amounting to 26 per cent. of the total. Of the 3,715 advisory soil samples, 3,155, or 85 per cent., were from Southern Rhodesia and 546, or 15 per cent., from Northern Rhodesia, only a negligible number of soil samples being received from Nyasaland and foreign countries. Flue-cured tobacco and maize were again the two main crops for which fertilizer recommendations, based on soil tests, were required, flue-cured tobacco accounting for 40 per cent. and maize for 30 per cent. of all advisory soil samples analysed. Compared with the preceding year, the demand for fertilizer recommendations for tobacco has increased, whilst that for recommendations for maize has decreased.

The Soil Survey Section investigated the soils of a number of irrigation projects for the Southern Rhodesia Department of Native Agriculture to assess their suitability for irrigation. This included three areas in the south-east of Southern Rhodesia, four areas in the south-west of Southern Rhodesia, and an irrigation project in the Nyamaropa Reserve. The Buleya area, in the Zambezi Valley, was examined at the request of, and in collaboration with, the Northern Rhodesia Ministry of African Agriculture.

Field and laboratory studies on the measurement of hydraulic conductivity were carried out on a number of soil types, and the laboratory work included the chemical analysis of 225 soil samples as well as a number of differential thermal analyses of clay fractions. The Senior Officer-in-Charge of the section prepared a pedological map of Southern Rhodesia which is to be used for the soil map of Africa to be published by C.C.T.A.

Three pedologists are now seconded to the Department of Conservation and Extension (i.e. two in Salisbury and one in Lusaka) to assist in land classification aspects of farm planning, and closest co-operation has been maintained with the Farm Planning Section of that department in this work.

Good progress has been made by the Research Section during the year, although the lack of suitable greenhouse facilities for accurate pot experiments and of more adequate technical assistance are seriously limiting factors. The studies on sandveld fertility have been continued, and several pot experiments have been carried out. Soil acidity and a low base status have been recognized as important factors causing infertility of sandveld soils, and in Kalahari sand sulphur and boron have been found to be deficient. New work for a more detailed study of both chemical and physical characteristics of sandveld soils, including their organic matter status, has been started.

An investigation on the chloride content of Rhodesian soils has been carried out, and field trials and laboratory tests on methods of incorporating lime in soils have been initiated. The new method of determining available soil phosphorus by the use of anion-exchange resin has been further studied and found to be superior to the alkali-extraction procedure.

In the spectrographic laboratory a new procedure has been developed which permits of the simultaneous determination of nearly all biologically important elements. Investigations on the effect of fertilizers and green manure on the concentration of major and minor elements in maize have been carried out. Other spectrographic work included analyses of *Salvinia auriculata* and water from Lake Kariba, carried out for the Kariba Lake Co-ordinating Committee, advisory work on nutritional disorders in crops and farm animals, and analytical work for the Criminal Investigation Department.

Work in soil physics during the year was largely of a preliminary nature owing to the absence on long leave of the soil physicist.

As in previous years the Chief Agricultural Chemist and senior members of the staff have again served on a number of committees, such as the Departmental Research Advisory Committee, the Fertilizer Advisory Committee, the Kafue Pilot Polder Committee, the Hydrology Co-ordinating Committee, the Salvinia (Kariba Lake) Sub-committee, and others. Several members of the staff served on working parties of the Advisory Committee on African Agricultural Production. Lectures were given to students of Gwebi Agricultural College, to Farmers' Associations, to courses for Conservation and Land Development Officers, Police Officers, and others. A number of popular articles and scientific papers have been published or prepared for publication during the year by members of the staff, and are listed at the end of this report.

Mr. J. G. Thompson, Officer-in-Charge, Soil Survey Section, attended two conferences convened by the Inter-African Pedological Service, in Paris, from 18th to 22nd September 1961. At the first meeting the legend for the Soil Map of Africa was discussed and finalized. It is gratifying to note that, of the contributions made to this map by the countries concerned, that of Southern Rhodesia is one of the most detailed. The other conference was the fifth meeting of the Council of S.P.I., at which the future pattern of scientific and technical co-operation on soil matters in Africa, as well as the future of the organization itself, was discussed.

Mr. B. D. Soane, soil physicist, attended the First Inter-African Hydrological Conference at Nairobi and presented a paper on the use of evaporimeters in irrigation control. He subsequently visited the soil physics laboratory of the East African Agricultural and Forestry Research Organization at Muguga, Kenya, and the Scott Laboratories at Nairobi.

The Fifth Conference of the Professional Officers of the Department of Research and Specialist Services, held at Gwebi in November 1960, was attended by most members of the professional and technical staff, and papers were presented by Mr. R. G. Thomas and Dr. D. H. Saunder.

The symposium "Africa and Irrigation", organized by Wright Rain Ltd., and held in Salisbury in August 1961, was attended by the Chief Agricultural Chemist and several senior members of the staff, and Mr. B. D. Soane read a paper at this symposium.

All members of the staff are to be thanked for their loyal co-operation and devotion to duty throughout the year, under often trying circumstances. Detailed accounts of the activities of the individual sections follow.

GENERAL SECTION

The work of this section during the year was adversely affected by staff changes, by the activities of the Public Works Department on two occasions, once when a new fume extraction system was installed and once when the building was redecorated, and finally by absence on military duty of one of the professional officers. Taking these circumstances into account the total output of 3,578 samples analysed must be considered very satisfactory, even though it represents a decrease of 11 per cent. as compared with last year's output of 4,012 samples.

A detailed breakdown of the figures of materials analysed during the last two years is given in Table II.

TABLE II

SAMPLES ANALYSED IN THE GENERAL SECTION

	1960–61	1959–60
Fertilizer, Manures and Limes—Fertilizers	10	26
Fertilizers (under the Act)	42	28
Composts and kraal manures	12	12
Miscellaneous wood-ashes, etc.	3	10
Limestones	21	21
Farm Feeds and Vegetable Products—Farm feeds	57	72
Farm feeds (under the Act)	114	32
Cereals	31	343
Legumes	421	220
Tobacco	2	4
Grasses and silages	859	141
Other vegetable products	393	296
Animal Products—Blood samples	247	364
Miscellaneous animal products	54	35
Feeds and Faeces from Feeding Trials	455	1,473
Oils and Fats	4	1
Essential Oils	2	3
Waters	219	207
Toxicology—Analyses for arsenic—Positive	266	352
Negative	268	262
Other poisons	48	43
Protection Products—Arsenical dips	24	35
Organic dips	2	21
Dips (under the Act)	5	3
Miscellaneous	19	11
TOTAL	3,578	4,012

Of the total number (3,578) of samples, 3,299, or 92 per cent., were analysed for various Government departments, as shown below:

Official samples taken under the Act	161
Research Section, Chemistry Branch	188
Departmental Research Stations (including Gwebi Agricultural College)	1,949
Veterinary Department	830
Hydrological Branch, Southern Rhodesia Division of Irrigation and Lands	44
Southern Rhodesia Department of Native Agriculture	64
Others	63
Total for Government Departments	3,299

In addition, 12 Winchester quarts of standardized caustic soda solution were prepared for the Dairy Branch and 96 Winchester quarts of dip-testing iodine solution for the Veterinary Department.

While, compared with last year's figures, work for Government departments showed a slight increase, samples from private individuals and firms decreased from 837 in 1959–60 to 279 in 1960–61.

Official Samples (*taken in terms of the Fertilizers, Farm Feeds, Seeds and Remedies Act, 1952*). During the year, 42 fertilizers, 114 farm feeds and 5 cattle dips were sampled and analysed, compared to the 1959–60 figures of 28 fertilizers, 32 feeds and 3 dips. Apart from this, manufacturers' premises in Bulawayo and Umtali were inspected by the British South Africa Police to ensure that all products sold were registered and that the labels attached to the products conformed to the provisions of the Act. All samples analysed came within the standards required, and only some minor infringements of the regulations had to be dealt with.

Fertilizers, Manures and Limestones (*other than official samples*). The amount of work under this head continued to decline. Only 46 samples were reported on as compared to 69 in the previous year, although the number of limestone samples analysed remained the same.

Farm Feeds and Vegetable Products (*other than official samples*). The samples reported under this heading increased in number from 1,076 in the previous year to 1,763. Samples from the research stations comprised the bulk, 431 samples coming from the Henderson Research Station, 415 from Grasslands Agricultural

Research Station, 205 from the Matopos Research Station, and 168 samples were analysed for the Research Section of this Branch.

Animal Products. Of the 301 samples in this group 247 were blood samples for the determination of inorganic phosphorus or serum calcium. Compared with the previous year, the number of blood samples analysed decreased, as certain research projects on phosphorus metabolism have terminated. There is, however, an increasing demand for serum calcium determinations. The largest item in the miscellaneous animal products category was 27 liver samples for copper and cobalt determinations requested by the Henderson Research Station.

Feeds and Faeces from Feed Trials. The figures under this heading, indicating an apparent decrease of approximately 1,000 samples for the year 1960–61 are somewhat misleading. In actual fact, the technical assistant who was seconded to the Henderson Research Station for a period of four months, analysed during this period approximately 450 such samples which would normally have been analysed in this laboratory.

Essential Oils. Due to the revived interest in geranium oil, the extraction plant of this laboratory has been overhauled and pilot plant facilities for the extraction of essential oils are once again available. Two samples of geranium leaf were analysed in the last month of the year.

Waters. The demand for water analysis remained constant with a considerable proportion being requested by the Hydrological Branch of the Southern Rhodesia Division of Irrigation and Lands and the Southern Rhodesia Department of Native Agriculture. Of the 219 samples analysed, 66 samples were from the Chibuwe borehole in the Sabi Valley.

Toxicological Samples. After consultation with the Veterinary Department, the pattern of toxicological analysis has been changed to the benefit of the veterinarians. Under the new system, only one organ is analysed when a specific poison is suspected, but a quantitative analysis is carried out, whereas previously several organs or specimens of the same animal had to be tested by the use of semi-quantitative methods. The apparent decline in the number of toxicological specimens tested is due to this reorganization. Most of the 582 toxicological samples were for arsenic tests, and approximately half of them proved positive.

Protection Products (*other than official samples*). Only 26 dip samples were analysed during the year as against 56 samples for the previous year, the decline being particularly pronounced for organic dips.

Other Activities

Progress has been made during the year with the investigation into the malting properties of sorghum, rapoko and munga. To date, seven samples of rapoko, six samples of sorghum and two samples of munga have been malted over periods ranging from three to eight days, and the change in diastatic power has been determined, 72 samples of malt being analysed. From the preliminary results it appears that the optimum malting time for rapoko and for sorghums is about six days. This work is being continued.

The collection of monthly radioactive fall-out samples for the United States Atomic Energy Commission has been continued, and a report on this work has been published in the *Rhodesia Agricultural Journal.*

SOIL TESTING SECTION

The section has functioned normally throughout the year and has maintained a satisfactory output and standard of efficiency, in spite of considerable staff changes. In the laboratory itself there has been a complete turnover of analysts, but fortunately the newcomers have shown aptitude and a high sense of responsibility. One experienced professional officer resigned at the commencement of the most critical season of the year. The vacant post has not yet been filled, but the temporary expedient of appointing a supernumerary technical assistant and a reorganization of duties made it possible for the remaining professional officer to devote most of his time to the writing of advisory reports and so to fill the gap. The way in which this officer and the technical assistant who took over part of his other duties accepted their increased responsibilities enabled the section to weather a difficult situation.

The number of samples received for normal advisory purposes was 3,909, which was 7 per cent. higher than the figure for the previous year. Samples received in connection with research projects and investigations were 1,082, which represented an increase of 19 per cent. on the previous year. The increase in the

total number of samples received (4,991) was 9 per cent. It appears, therefore, that the demand for the soil testing service continues to expand, though probably at a somewhat slower rate than in recent years.

Advisory reports issued numbered 1,257 and entailed interpretation of the analyses of 3,715 samples and assessment of soil fertility and crop requirements or diagnosis of the cause of poor responses. In addition, soil analysis reports were issued on 1,294 samples submitted for the purpose of compilation of scientific data or for correlation with response data from critical field experiments.

The nature of the advisory service provided, and the extent to which it is used by different sections of the farming industry in the Federation, are demonstrated in Table III. Broad comparisons, including figures for the previous year, are presented in Table IV.

TABLE III

SOIL SAMPLES UPON WHICH REPORTS WERE ISSUED

	Southern Rhodesia	Northern Rhodesia	Nyasaland	Foreign	Total
ADVISORY:					
Tobacco: Flue-cured	1,255	212	—	12	1,479
Turkish	16	2	—	—	18
Other types	8	—	2	—	10
Seed-beds	47	4	—	—	51
Maize	853	266	—	—	1,119
Wheat	7	5	—	—	12
Potatoes	50	3	—	—	53
Other cash crops	64	2	—	—	66
Green-manure crops	16	3	—	—	19
Lucerne and fodder crops	88	3	—	—	91
Pastures	56	5	—	—	61
Market-garden crops	53	3	—	—	56
Fruit trees, vines, etc.	20	14	—	—	34
Sugar-cane	29	—	—	—	29
Tea and coffee	16	—	—	—	16
Other specialized crops	1	—	—	—	1
Native rotations	4	—	—	—	4
Conservation and Extension demonstrations, etc.	29	8	—	—	37
Private gardens	167	2	—	—	169
Sports clubs	47	—	—	—	47
Diagnosis and fertility assessment	95	13	—	—	108
pH tests and liming rates	231	1	—	—	232
Miscellaneous analyses	3	—	—	—	3
TOTAL	3,155	546	2	12	3,715
*INVESTIGATORY:					
Chemistry Branch	296	—	—	—	296
Research and Specialist Services	604	—	—	—	604
Conservation and Extension	14	3	—	—	17
Territorial Departments of Agriculture	260	—	22	—	282
Statutory bodies	12	—	—	—	12
Other scientific organizations	—	—	—	83	83
TOTAL	1,186	3	22	83	1,294
GRAND TOTAL	4,341	549	24	95	5,009

* Includes only analyses for compilation of scientific data or for purposes of correlation with experimental data or field observations.

From Table IV it will be seen that more samples have been received for advice on tobacco, and less for advice on maize, than in the previous year, whereas there has been no change in regard to other crops. The ratio of tobacco to maize has widened, which is a reversal of the trend noticed in recent years. This is particularly evident in the case of Northern Rhodesia where there has been a significant decline in the total number of samples, almost entirely at the expense of maize, but a considerable rise in tobacco samples.

Two changes in laboratory procedure have been introduced during the year. pH values are now measured in M/100 calcium chloride suspensions and expressed as such, without applying an empirical correction to convert them to the corresponding conventional values. We are fully convinced that this step is justified, in spite of some temporary confusion or inconvenience that may possibly occur until farmers have become accustomed to thinking in terms of the new scale of values. The reasons for the change and the significance of the new values are explained briefly in a pamphlet issued with all soil reports, and an article has been published in *The Rhodesian Farmer*. A fuller paper has been prepared and submitted for publication in the *Rhodesia Agricultural Journal*.

TABLE IV

ADVISORY SOIL SAMPLES REPORTED: COMPARATIVE DATA

This table shows, according to territories and categories of work:
(*a*) The number of samples upon which advisory reports were issued.
(*b*) This number as a percentage of the territorial total.
(*c*) This number as a percentage of the grand total from all sources.

	Year under review			Previous year (1959–60)		
	(*a*)	(*b*)	(*c*)	(*a*)	(*b*)	(*c*)
Southern Rhodesia:						
Flue-cured tobacco	1,255	40%		1,040	35%	
Maize	853	27%		834	28%	
Other crops	475	15%		476	16%	
Miscellaneous*	572	18%		610	21%	
TOTAL	3,155		85%	2,960		82%
Northern Rhodesia:						
Flue-cured tobacco	212	39%		161	25%	
Maize	266	49%		409	63%	
Other crops	44	8%		40	6%	
Miscellaneous*	24	4%		39	6%	
TOTAL	546		15%	649		18%
Nyasaland:						
Flue-cured tobacco	—			—		
Maize	—			—		
Other crops	2			2		
TOTAL	2		·1%	2		·1%
Foreign Countries:						
Flue-cured tobacco	12			13		
Maize	—			—		
Other crops	—			7		
TOTAL	12		·3%	20		·6%
Totals from all sources:						
Flue-cured tobacco	1,479		40%	1,214		33%
Maize	1,119		30%	1,243		34%
Other crops	521		14%	525		14%
Miscellaneous*	596		16%	649		18%
GRAND TOTAL	3,715			3,631		

* "Miscellaneous" includes: private gardens and sports clubs; Conservation and Extension demonstrations, etc.; analyses for diagnostic purposes and for lime requirements only; analyses for non-agricultural purposes.

The other change is in the method of assessing lime requirements. By introducing an additional routine determination it is now possible to obtain an approximate figure for total exchangeable bases. From this and the base saturation, inferred from a correlation that has been established with the calcium-chloride pH, lime requirements can be assessed with greater accuracy than by the former method.

SOIL SURVEY SECTION

FIELD WORK

As in the previous year, field work comprised a number of short-duration surveys in contrast to the one or two surveys of longer duration which, in the past, accounted for most of the field season. The majority of the year's surveys were carried out at the request of the Southern Rhodesia Department of Native Agriculture in order to assess the suitability of soils for irrigation in various parts of Southern Rhodesia.

The more important surveys undertaken during the 1961 field season were:

Native Department Irrigation Projects in the South-east of Southern Rhodesia. In this investigation three separate areas listed below were examined:

(a) The Sengwe area, which is a strip of country approximately 17 miles in length, adjacent to the Limpopo River. It extends from the Bubi-Limpopo confluence to the Moçambique border.

(b) The Fichana project, which is a relatively small area of alluvial and colluvial soils on the south bank of the Lundi River, about 25 to 30 miles from the Moçambique border.

(c) The Maruhmbine project, which involves a strip of country, approximately eight miles in length, also on the south bank of the Lundi River, immediately upstream from the Sabi-Lundi confluence on the Moçambique border.

Native Department Irrigation Projects in the South-west of Southern Rhodesia. The work in this part of the country involved the examination of two large areas and several very much smaller areas of colluvial and alluvial soils. They were:

(a) Nitabas Nyoni and Bembeswaan, both over 1,000 acres in extent, in the Semokwe Reserve, Matobo District.

(b) The Tuli-Shashi confluence, in Special Native Area "D" of the Gwanda District.

(c) Minor areas along the Shashi River near the British South Africa Police post, in S.N.A. "G" in the Beitbridge District.

(d) Mbudzana, at the Mbudzana-Umzingwane confluence in S.N.A. "F" of the Beitbridge District.

The Nyamaropa Irrigation Project. The soils of a 1,700-acre irrigation project in the Nyamaropa Reserve were examined. This project, which is nearing completion, lies to the north of Inyanga in an area of relatively high rainfall, situated at an altitude of about 2,700 feet.

The Buleya Area, Zambezi Valley, Northern Rhodesia. The soils of an approximately 20,000-acre block of land on the Kariba Lake shore, about 20 miles north-east of Sinazongwe, were examined for suitability for irrigation at the request of the Northern Rhodesia Ministry of African Agriculture.

Other minor surveys included visits to the Nuanetsi and Mcheni ranches and the Chibuwe Irrigation Scheme in the south-eastern low-veld of Southern Rhodesia and to parts of the Mkushi area in Northern Rhodesia.

Hydraulic Conductivity Measurements. During the course of the field work, *in situ* measurements of hydraulic conductivity were made on widely differing types of soil horizons. These soil horizons varied in texture, structure and compaction, and hence in permeability. As a result of this and future work it is hoped that it will be possible to calibrate the permeability factors assessed on the basis of morphological features, in terms of hydraulic conductivity.

Laboratory Work

Two hundred and twenty-five soil samples were analysed during the year, most of which were taken during surveys carried out in the 1959-60 period. A large proportion of these samples were from high-rainfall areas, mainly in the Eastern Districts of Southern Rhodesia, but included 13 samples from the Cholo and Mlanje areas of Nyasaland. From Northern Rhodesia, 22 samples were analysed, most of which were sent in by the pedologist seconded to the Department of Conservation and Extension.

More specialized laboratory investigations included differential thermal analyses carried out on 25 clay fractions separated from selected soil samples taken during the last three years. 51 hydraulic conductivity measurements were also made on disturbed soil samples. In connection with this latter field of investigation, a core sampler was designed for taking undisturbed cores of 3-in. diameter. The sampler will have a much more important application, however, in work on bulk density, porosity, and water held at various tensions.

Collaboration in Farm Planning

With the secondment of Mr. E. Griffiths at the beginning of 1961, three pedologists are now on whole-time secondment to the Department of Conservation and Extension to assist with the land-classification aspects of farm planning. The two senior members of the section made a tour of the line-of-rail in Northern Rhodesia with the pedologist in that territory to study and discuss representative soil types and their classification. Contact was maintained with the pedologists in Southern Rhodesia, who visited the laboratory to discuss problems as they arose.

A two-day conference attended by senior members of the Soil Survey Section and of the Farm Planning Section of the Department of Conservation and Extension, as well as by the seconded pedologists, was held, at which all aspects of collaboration in farm planning were discussed. This conference proved so valuable that it was agreed that it should be held annually.

Draft proposals for revised criteria suitable for the high-rainfall regions were drawn up as a basis for future discussion. Members of the Branch have taken

their usual part in lectures and practical demonstrations to instructional courses on the principles and methods of soil examination and the assessment of land-capability classes.

Collaboration with the Inter-African Pedological Service

The Senior Officer prepared a pedological map of Southern Rhodesia on a scale of 1 : 1,000,000, based mainly on the draft system of classification proposed by the Inter-African Pedological Service (S.P.I.). The data presented on this map will be incorporated in the Soil Map of Africa to be published in due course by C.C.T.A.

RESEARCH SECTION

The work conducted by this section again covered a wide field and a good deal of information was gathered. Progress is, however, being hampered by the lack of technical assistance available to the research workers who at the present have to spend a great deal of time on routine (albeit essential) determinations and computations and, in consequence, are not able to use their abilities to the full.

Sandveld Fertility

From accumulating evidence it appears that soil acidity is often a major cause of trouble on sandveld soils, whilst, on the poorer sands, multiple nutrient deficiencies also occur. In order to maintain the productivity of these soils, special care appears to be required to maintain both a satisfactory pH level and a suitable nutrient balance, particularly of the cations, potassium, magnesium and calcium, as well as of boron.

Work on this problem was concentrated on various aspects of soil acidity and the use of lime. Pot experiments were conducted with both Kalahari and granite sand.

In the experiments conducted on Kalahari sand it was found that the major deficiencies in this soil were boron and sulphur, and where these elements were applied there was a response to lime. Lime increased the availability of sulphur. Boron increased the uptake of calcium, which was very low in this soil, and also improved the plants' ability to recover from wilting. It is considered that a lack of boron could account for the disappointingly small response to liming which had been observed in the field.

The interaction of lime, fertilizer and climate on the growth of soya-beans was studied in a pot experiment using both a granite sand and a red clay. It was found that when the plants were grown in a suitable climatic environment they were more tolerant of soil acidity and responded less to lime than when they were grown at a low temperature. The response to fertilizers was not affected by climate in this way. In this experiment the physical condition of the soil had little effect upon the response to other factors.

During studies of the soluble aluminium content of soils it was found that storage of dry soils resulted in an increase of soil pH and a decrease in soluble aluminium. The change in soluble aluminium which occurred after wetting of sandveld soils and incubation for varying periods was therefore determined, but was not found to be sufficiently great to warrant further work. The soluble aluminium content of soils was found to depend primarily on pH and to rise rapidly at pH values less than 4.5 (in M/100 $CaCl_2$ solution).

Following this preliminary work preparations were commenced later in the year for undertaking a detailed study of the characteristics of sandveld soils, both chemical and physical, in order to determine the main limiting factors in these soils and how best to maintain their fertility under different conditions. A good deal of time has been spent in studying suitable techniques, and constructing apparatus, for this work, on which it is proposed to concentrate most of the resources of the Research Section during the coming year. Aspects which will be studied, in soils subjected to different management practices, are:

(i) The organic carbon status, particularly the relative proportions of carbon in coarse, undecomposed residues, finely divided carbon and also carbon associated with clay particles.

(ii) The structural importance of this organic matter and the rates of release of nutrients from it.

(iii) The density and pore-space distribution of the soil and the stability of the clay.

(iv) Nutritional requirements, using both analytical and pot-test techniques.

Incorporation of Lime in Soils

In view of the importance of lime and of the number of occasions when, on acid soils, its use has been ineffective, work has been commenced on methods of incorporation of lime since this may greatly influence results obtained in the field. Field trials involving discing and ploughing treatments have been initiated at the Henderson Research Station, the Copperbelt Experimental Farm and on a problem soil in the Mazoe Valley, where lime has been shown to be important. These trials are being backed by laboratory determinations of the rate of reaction of lime.

Effect of Drying upon Mineralization of Soil Nitrogen

Studies of the effect of drying in the field on the rate of mineralization of nitrogen upon rewetting the soil were continued. On the Salisbury red clay, drying, as such, in the field had little effect compared with that of ploughing, which led to a definite increase in rate of mineralization.

Phosphate Availability in Soils

It was reported last year that the anion-exchange resin procedure for estimating available soil phosphorus had been satisfactorily developed, but when the procedure was used in the routine soil testing laboratory satisfactory results were not obtained. Accordingly the possible sources of error in the procedure were investigated and slight modifications have been made in the techniques of colour development and resin regeneration.

All the soils for which data on responses to phosphorus in the field are available are being analysed by the modified procedure and the correlation between soil data and field response will be re-examined. Results so far obtained support the conclusion reached last year that the resin-extraction procedure has considerable advantages over the alkali-extraction procedure.

Chloride Content of Rhodesian Soils

In view of the recent interest in chlorine in tobacco a survey was conducted of the soluble chloride contents of the main soil types of Rhodesia. The chloride contents were, in general, low, averaging 4–9 parts per million in the top-soils, and 3–6 parts per million in the sub-soils. The higher chloride contents were found only in soils with defective drainage, such as poorly structured sedimentary soils and vlei soils. The results have been presented for publication.

Soil Physics

Following the transfer early in the year of the Soil Physicist from the Sabi Valley to Salisbury, work has been concentrated on establishing the new soil physics laboratory and in designing equipment, particularly soil samplers (both auger and undisturbed-core types), tensiometers, and tension tables for pore-space distribution studies in the low-suction ranges.

Little investigatory work was possible during the year owing to the absence on long leave of the Soil Physicist. However, preliminary work was attempted on direct soil-sampling techniques for studying the water use of rainfall-grown crops in Region II. This proved to be very laborious and of relatively little value once the rains were established, because of lack of information in deep percolation and run-off. This work could be better conducted at the Henderson Research Station, where lysimeters, which could be converted to evaporimeters, are available, provided additional technical assistance could be obtained.

Moisture deficits at the beginning of the rains at both the Henderson and Salisbury stations were found to be between 3 and 5 in. in the top 3–4 ft. Surprisingly, a greater deficit was found at the Henderson Research Station on plots where a heavy maize crop had been grown in the previous season than on plots under star grass or natural vegetation. This requires to be checked in further work.

Spectrographic Work

During the year a spectrographic procedure was developed which permits of the simultaneous determination in plant ash of nearly all the biologically important minerals. The basis of the method is to use a Stallwood-type air-jet around the arc to intensify the weak zinc, boron and phosphorus lines and at the same time reduce the intensity of other strong lines. This represents a considerable advance in spectrographic technique and has led to a great saving in time of analysis of plant material. Details of the procedure have been presented for publication.

Using this technique, the effect of various fertilizers and soil amendments on the uptake of major and minor elements by maize was studied.

Two experiments, one where nitrogen and potassium and one where phosphate and green-manuring had given large yield responses, were examined in detail. The changes in plant composition brought about by these treatments are reported in a paper which has been prepared for publication. Information of this type in the literature is scanty, but it is important for a better understanding of the uptake of nutrients by plants and is, therefore, an important background for diagnostic work. Of particular interest was the observation that the molecular concentration of potassium, magnesium and calcium in the leaf remained constant.

In addition to this investigatory work, a number of plant analyses were carried out for the diagnosis of nutritional disorders in advisory work and also in connection with sandveld fertility studies. In the course of the advisory work, low copper levels were encountered in citrus in a number of areas and low zinc levels were found in maize, particularly in the Lusaka area.

An investigation was carried out into the possible incidence of copper deficiency in sheep and dairy cattle on a farm in the Hartley area. Plant, hair, blood and liver samples were analysed, but although certain copper levels tended to be low, no conclusive results were obtained. Feeding trials have been suggested.

A certain amount of analytical work was again carried out for the Criminal Investigation Department and led to successful characterizations of materials in three court cases.

Salvinia auriculata *on Lake Kariba*

In connection with investigations initiated by the Salvinia sub-committee of the Kariba Lake Co-ordinating Committee, a number of samples of weed and of water were analysed.

Analyses have been made in connection with the potential feeding value of the weed. A "true" protein content of about 10 per cent. was found in fresh weed, which might be sufficiently high to warrant exploitation. This protein was not, however, readily concentrated by extraction procedures which were tested by the Government Analyst. The palatability and feeding value of the weed is to be tested in feeding trials with sheep at the Henderson Research Station.

Preliminary analyses were also carried out in connection with studies of the ecology of the weed, due to be carried out at the University College of Rhodesia and Nyasaland. The high potassium content of the weed (about 4 per cent.), compared with that of the water (about 1–2 p.p.m.) may possibly be of importance. It is tentatively suggested that a shortage of this element might conceivably limit future growth of the weed; it appears possible that a relatively high potassium concentration in the water first filling the lake as a result of inundation of the land, particularly in areas where brushwood had been burnt, might have contributed to the early explosive growth of the weed.

Correlation of Fertilizer Responses in the Field with Soil Analysis Data

Some time was again spent in collecting results from field trials conducted on research stations and farms throughout the country. A considerable amount of data has now been collected but, unfortunately, it has not yet been possible to find the necessary time to tabulate and correlate it. It is, however, becoming increasingly important that this should be done in order to test the procedures used for making fertilizer recommendations more rigorously than has been possible with limited data in the past and in order to improve the interpretive criteria by making use of new experimental data.

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ENTOMOLOGY BRANCH

J. A. WHELLAN, *Chief Entomologist*

INTRODUCTION

DURING THE YEAR the posts which had fallen vacant were filled and it is hoped that the stability in research which resulted may continue. Of the existing staff, Mr. Whellan has been mainly concerned with phytosanitary matters and biological control of lantana, Mr. Rose with maize streak and potato tuber moth, Mr. Wilson with corn root-worm and general advisory matters, Mr. Carnegie with deciduous fruit insects and advisory work for the Eastern Districts, and Mr. Martin with helminthology. Mr. J. Goldsmid, who joined the branch in March, is making a special study of the mites which, as in so many other localities, seem to be becoming more and more important agriculturally. Mr. J. A. K. Farrell joined in September and is working on the pests of stored products in close association with the Grain Marketing Board. It has not so far been found possible to fill the newly authorized post of apiculturist.

The Chief Entomologist presided at the thirteenth session of the Council of the International Red Locust Control Service held at Nairobi, Kenya, in August and represented the Federation at the Council meeting of the International African Migratory Locust Organization held at Bamako, Mali, in May. He has also attended several meetings of the South-Western Tobacco Marketing Board's Sub-committee examining the provision of vacuum fumigation facilities for tobacco at Beira, of the Pesticides Sub-committee of the Rhodesian Standards Association, of the Trypanosomiasis Committee, of the Rhodesia Seed Potato Association and of the National Publications Trust. Mr. Carnegie attended the deciduous fruit course at the Western Province Research Station at Stellenbosch, C.P., and took the opportunity of discussing entomological problems connected with fruit culture with the staff there. Mr. G. C. Martin attended the First Inter-African Nematology Conference which was held at Nairobi in October 1960, and presented two papers.

INVESTIGATIONS AND RESEARCH

PINK BOLLWORM (*Platyedra gossypiella*)

Several surveys for pink bollworm in the Sabi Valley have been made during the year. A localized infestation was found at Nyanyadzi in *Hibiscus dongolensis*. Further search after this had been cut out revealed no pink bollworm, and no other records of the occurrence of this insect were made. It is thus clear that the level of infestation of this insect is very much lower than it was in 1959–60. There can be little doubt that the strict enforcement of a close season for cotton, together with the destruction of the main alternative host-plant, has in large measure been responsible for this satisfactory state of affairs, while the fumigation of all seed-cotton with methyl bromide before it leaves the infested area has effectively prevented the spread of the pest. As the area suitable for the development of pink bollworm and of *H. dongolensis* is large, and mainly wild and inadequately explored, it is likely that the insect will persist at a low incidence and remain a threat which could become dangerous should precautionary measures be relaxed.

FRUIT INSECTS

The work on fruit insects all refers to the Eastern Districts. The survey of fruit-fly incidence has been extended to cover wild fruits. It has been found that the flies common in wild fruits do not of necessity breed also in cultivated fruits. For example *Pardalaspis cosyra* is common in *Sclerocarya caffra* but has not been found in cultivated fruits. Altogether twelve species have been identified from various fruits. These include the Mediterranean fruit-fly *Ceratitis capitata* (Wied.) from citrus only, the Natal fruit-fly, *Pterandrus rosa* (Karsch) from peach, rose apple *(Eugenia jambos)* and probably also from *Garcinia livingstoniana, P. rubivorus* (Coq.) from raspberry and *Pardalaspis quinaria* Bezzi, the five spotted fruit-fly from peach, as well as a number of other species from wild fruits.

An experiment to compare the efficacy of two baits and a cover spray on peaches had somewhat inconclusive results, probably because the experimental trees were too close together and interacted. All treatments, however, resulted in an improved yield.

One similar trial against melon flies on cucumber and gem squash yielded inconclusive results, probably for the same reason, but another on gem squash was more satisfactory. The systemic insecticide, dimethoate, was used as a cover

spray and compared with baits using fish protein and sugar as the attractants and malathion as the insecticide. The baits showed some advantage over the controls but the cover spray gave a considerable improvement over both baits and controls.

Experiments were carried out with woolly aphis on apple to test foliar sprays and trunk injections of insecticides. Of foliar sprays metasystox and diazinon gave quick and lasting results while malathion and dimethoate, though less effective, were better than the controls. Injections of metasystox and dimethoate into the trunks did not harm the trees and gave excellent results if the part of the sap stream affected included the test branches. Otherwise there was little or no effect. The parasite *Aphelinus mali* was introduced from the Western Province Research Station. Releases have been made and the parasite shows promise of establishing itself.

Bean Stem Maggot (*Melanagromyza phaseoli*)

Seed-dressing trials were continued with the co-operation of the Senior Agronomist at Henderson Research Station. These consisted of a comparison of endrin and dieldrin, the concentrated emulsions being used as seed dressings with controls in randomized blocks. These confirmed previous findings in that both treatments gave full protection to the stem of bean plants. Although eggs were laid in the leaves of the treated plants the maggots failed to penetrate further than the petioles, so that the main stem did not become infested. Higher yields were obtained in the endrin treated plots than those treated with dieldrin. The latter may suppress yields to some extent while still giving an improvement on the untreated plots.

Maize Streak Investigations

In view of the increasing importance of streak disease in early irrigated and main plantings of maize, study of the insect vectors of this disease was given high priority. Experiments at Salisbury during December 1960 established that leaf hoppers *Cicadulina* spp. transmitted the disease, as had long been known in East and South Africa. All other hoppers collected from streak infected maize and grasses in the vicinity failed to transmit streak. Subsequent investigations have shown that four species of *Cicadulina* are vectors. These are *C. storeyi* China, *C. mbila* Naude, and two other species at present being studied at the Commonwealth Institute of Entomology. Three species have been shown to transmit streak from maize to maize, two species from maize to wheat, and one of these from wheat to maize. The fourth species, found only on wheat and grasses, has been confirmed as a vector in transmission from wheat to wheat only. Studies of the distribution and habitats of the different species are in progress. The life cycle of *C. storeyi* has also been investigated.

Surveys and laboratory investigations have confirmed that all species are able to survive the dry season and winter months and information has been collected as to their abundance and preferred host plants at different seasons of the year. The preliminary results of these investigations provide a guide to cultural practices that may be adapted by growers to limit chances of streak infection in crops.

Measures for direct control of hoppers by spraying verges of fields with DDT and dimethoate have also been investigated and these will be extended to field trials. Other measures include control of hoppers by spraying insecticides on grasses and other known habitats before planting of maize crops, and the use of insecticidal seed dressings. Some encouraging results have been obtained with a systemic seed dressing, disyston.

Potato Tuber Moth (*Gnorimoschema operculella*)

Tuber moth is the cause of heavy losses to potato crops. Field trials to compare various control treatments were carried out with the co-operation of the Federal Department of Conservation and Extension. Trials were carried out on three farms in the Enterprise area, three farms in the Bulawayo area, and on one farm at Hunters Road. The following insecticides were compared—DDT, sevin, endrin, malathion and thiodan. The results indicate that tuber moth has developed resistance to DDT in the Enterprise area. This confirms the suspicion of farmers in the area and is in agreement with findings in other parts of the world where DDT has been widely used. No evidence of resistance to DDT has been found in the Bulawayo area and in fact DDT was found to give the best control in that area. Otherwise good control was obtained with endrin and sevin, and malathion and thiodan were satisfactory alternatives. It was also shown that with the onset of the main rains damage due to tuber moth was spectacularly reduced. Some surveys regarding distribution and seasonal occurrence of tuber moth in relation to irrigation and rain grown crops were made. Further studies were made on the

life cycle under laboratory conditions. Tubers dipped in weak solutions of Malathion and DDT gave 100 per cent. kill of first instar larvae. This method would protect seed potatoes and could possibly be extended, by dipping potato sacks into insecticidal solutions, to protection of potatoes for human consumption.

Corn Rootworm (*Buphonella murina*)

Following the survey of the pest *Buphonella murina* (Gerst.) in the Southern Province of Northern Rhodesia in 1960 an extended study of the life cycle of this insect and experimental work on its control was commenced.

It appears that seedling maize is attacked by hatching larvae of corn rootworm and after about a week their presence is made apparent by the young leaves in the middle of the funnel wilting and dying. Plants attacked by corn root-worm are either killed outright or survive but develop suckers. In the latter case, however, the cobs never develop satisfactorily. Damage can be very extensive and crop stands may be reduced by over 40 per cent.

The pupal stage is about nine days and a second generation of adults appears about the beginning of the new year. The maize is, however, then generally out of danger, having grown too coarse for the young larvae to attack it and for the rest of the year the adults and larvae live on weed grasses in the verges and in the maize fields. There are probably two or three generations per year.

Eggs are laid on the soil surface, singly or in batches. Work at the Salisbury Experiment Station indicates that eggs laid in April enter a diapause and need a specific stimulus to renew development. Thus maize planted afer a crop of any kind with a prevalence of grass weeds is likely to be infected with corn root-worm.

Good chemical control is obtained by a few farmers using a fertilizer insecticide mixture placed above the seed at planting. Aldrin is used at present but experiments indicate that heptachlor would be more effective. The application of heptachlor through a granular insecticide applicator attached to the planter is a more promising method.

Experiments with seed dressings have been tried but much phytotoxicity has been encountered so that this method of control, which promised to be the answer for the African farmer, requires further investigation. The situation is further complicated by the presence of another beetle larva which causes very similar symptoms of attack on young maize. This has not yet been identified but has often been confused with corn root-worm by farmers. It is also being studied as occasion arises.

Rice Stalk-borer

Due to a very light stalk-borer infection at the Kafue Pilot Polder little progress has been made this year. Stalk-borer larvae probably represent a complex of species all of which attack rice. Some of the borers have been reared to maturity and belong to a previously undescribed species while moths captured in the area have been identified and found to belong to genera, some of which are known to attack rice elsewhere. There is no doubt that rice can be grown very successfully at the Pilot Polder in the absence of the borer, as this year's yields show.

Mites

A check list of mites found in the Federation is at present being compiled, together with a list of host plants for the mites identified. To date, 25 species of fully identified phytophagous mites are on record and a further 16 species have been identified down to the genus. Other mites on record include a few named predacious mites and a number of mites parasitic on insects.

The biology of *Dolichotetranychus australianus,* which causes much damage to lawn grass, is being studied.

Despite the wide occurrence of concentric ring blotch in the Federation, no grey mites *(Calacarus citrifolii)* have been found to date. However, all infected trees have been found to harbour *Brevipalpus* mites, the two species so far found being *B. californicus* and *B. phoenicus.*

Insects Associated with *Lantana camara* and Biological Control

A collection of insects associated with *Lantana camara* in Rhodesia is being made as a parallel investigation to the possibility of controlling the weed by biological methods. For this purpose, large numbers of berries have been collected and, from them, numbers of small agromyzid flies were reared. These have been identified as *Ophiomyia rhodesiensis,* a species described originally from Chilanga in Northern Rhodesia. The flies appear to pass through the larval and pupal stages

inside the berries of the plant. There is a possibility, however, that the insects are really *Ophiomyia lantanae,* a species used for the biological control of *Lantana* in many parts of the world, and recently introduced into Kenya and Natal for that purpose. This is now being investigated. Two caterpillars found on the leaves of *L. camara* at Salisbury were reared and the moths subsequently identified as *Hypena strigatus* F. This may be identical with *H. jussalis,* another species which has been used for the biological control of *L. camara.* A further twenty-one different species of insects collected from Lantana are at present overseas for identification purposes. A Tingid bug, *Cysteochila endeca* Drake, was found amongst the berries. It bears a considerable resemblance to another tingid, or lace-bug, *Teleonemia scrupulosa,* which is one of the principal insects used in the biological control of lantana. Several hundred examples of this insect were collected by the Chief Entomologist during his visit to Kenya. After screening for parasites, most of the residue has been liberated on lantana bushes planted for the purpose at Salisbury Experimental Station. So far the insects seem to be no more than holding their own but weather conditions may have been against them. The Chief Entomologist also collected berries in Kenya from which were bred about 30 or 40 Lantana flies, *Ophiomyia lantanae.* Screening showed some parasitism by a chalcid wasp, possibly identical with one reared from *O. rhodesiensis* in Salisbury. No suitable lantana berries were available at the time for breeding *O. lantanae* so that this import has been lost. Further imports will be made if these species prove distinct from that already occurring here. Otherwise there would be no purpose in this, and other insect species, available in Hawaii, will need to be considered for biological control.

Stored Products Pests

Lack of staff precluded work on stored products pests being resumed but this will be rectified with the recent appointment of an entomologist specifically for this work.

Helminthology

The major part of the year was devoted to surveying the plant parasitic and potentially plant parasitic nematode fauna in the soils of the Federation. Specimens were collected from virgin and from cropping lands. Particular attention was given to tea, sugar and tobacco lands. Visits were made to tea estates at Chipinga and the Honde Valley, sugar estates at Chirundu, Triangle and Hippo Valley and tobacco farms along the route Salisbury–Bulawayo–Livingstone–Lusaka –Salisbury.

The experiment on the longevity of *Meloidogyne javanica* in soil was continued and after three years of bare fallow, light infections developed on tomato plants in red soil, sandveld and black clayey vlei soil. Egg masses of *M. javanica* yielded larvae on transfer to water, after being submerged for 429 days in a shallow solution of 2 per cent. sodium chloride, but after 450 days no larvae hatched. This indicates that hatching can be inhibited by a weak salt solution, and thus might similarly be inhibited in the soil for considerably more than a year.

Visits were made to Zona and Jersey Tea Estates at Mount Selinda, Ratelshoek and New Year's Gift Estates at Chipinga and the Eastern Highlands Estate in the Honde Valley. All examinations were confined to nursery sites. Very few plant parasitic nematodes (less than 500 per pint soil) were recovered from root and soil samples obtained from the Eastern Highlands Estate. At no estate did the numbers exceed 2,000 per pint of soil. *M. javanica* was recorded from four estates and *M. arenaria* from two. Plant parasitic nematodes cannot be regarded as a problem in tea nurseries in Southern Rhodesia and in view of the use of fumigants are not likely to become a problem.

Samples of root and soil from field sugar-cane were obtained from the Chirundu and Triangle Sugar Estates. Specimens were taken from healthy vigorous cane, unthrifty cane and badly stunted cane and it was found that the average numbers of plant parasitic nematodes per pint of soil were 3,753, 6,538 and 10,226 respectively. It would therefore appear that there is possibly a correlation between high plant parasitic nematode soil populations and poor or depressed growth of sugar-cane. *M. javanica* was found attacking the roots of cane at both estates, and at Chirundu, 32 different varieties from several parts of the world were infected and many were adversely affected.

Sixteen widely distributed tobacco farms along the Salisbury, Bulawayo, Livingstone, Lusaka, Chirundu to Salisbury route were visited. Soil samples were obtained and roots were examined from both virginia and turkish tobacco plants. Numbers of plant parasitic nematodes (other than *Meloidogyne* sp.) ranged from

100 to 8,500 per pint of soil but the average number was only 2,400 per pint. *M. javanica* was found to be widespread and in many cases heavy infections, causing considerable damage, were observed.

A survey was made of the plant parasitic nematodes in agricultural plots under European supervision in Barotseland. Root systems of a wide variety of crops were examined for root-knot nematode infections and soil samples were taken from wheat, rice, sugar and cassava lands. *M. javanica* was found to be widely distributed and heavy infections were seen. In addition *M. arenaria* and *M. incognita* var. *acrita* were recorded. Low soil populations of plant parasitic nematodes were recorded in association with both rice and cassava and moderate to high populations with wheat and sugar-cane.

ADVISORY SERVICE

A total of 752 pest inquiries was recorded at the Salisbury office and 187 at Umtali. This increase in numbers over the previous year reflects several pest outbreaks which were of general concern to the public and to farmers. An outbreak of army worm *Spodoptera exempta* occurred during April in many parts of the highveld. This was the cause of some damage to pastures and silage crops. Fortunately most maize crops were too far advanced to be susceptible to attack. A related species *Spodoptera triturata,* known as the lawn caterpillar, was the cause of widespread damage to lawns during March in Bulawayo, Salisbury and Umtali. *Spodoptera exigua,* the lesser army worm, was again an important pest of irrigated winter pea crops.

Plantations of pines, especially *Pinus patula,* in the Eastern Districts were subject to heavy infestations by caterpillars, *Orgyia basalis* and *Lechriolepis nephopyropa.* Both species have been responsible for considerable losses over several hundred acres of plantations and control has been difficult to achieve even with aerial spraying. These are indigenous insects which have not previously been recorded doing damage of this kind either in the Federation or elsewhere.

Amongst the more usual pests the following have been of particular importance during the year—potato tuber moth, *Gnorimoschema operculella* (including record of damage to tomatoes, though the adult was not reared); cut-worms, *Agrotis* spp., attacking young maize; maize ear-worm, *Heliothis armigera;* Loopers, *Phytometra* spp., on maize, soya-bean, potatoes and tomatoes; bean stem maggot, *Melanagromyza phaseoli;* fruit-flies, *Pterandrus rosa* and *Ceratitis capitata;* and pumpkin-flies, *Dacus* spp.

Mites continue to be of increasing importance. The tomato russet mite, *Vasates lycopersici,* has been of considerable importance in Salisbury and in the Eastern Districts of Rhodesia, causing loss of yields due to premature leaf fall. A red mite, *Dolichotetranychus australianus* and a white mite, *Aceria neocynodus,* have been very troublesome on lawns.

The corn root-worm, *Buphonella murina* has been confirmed as a widespread pest and a cause of poor stands of maize over a large area in Northern Rhodesia. During the course of investigation, referred to earlier in the report, advice was given to maize growers on measures that could be taken to protect crops. In a similar way, other current investigations have led to many more inquiries regarding pest problems under study, notably maize streak, tuber moth and deciduous fruit pests.

New records included *Tortrix capensana,* caterpillars feeding on fruiting stems of grapes and the cause of premature fall and loss of bunches of fruit; *Oscinella* sp., fly-maggots in shoots of grasses and the cause of damage to golf greens; *Atherigona parvipuncta,* stem-maggot in winter wheat, and *Scirpophaga* spp. moths reared from borers in rice at Kafue. Amongst several more unusual inquiries an infestation of larvae of a beetle *Necrobia rufipes* in a consignment of dried fish from Tanganyika, and of larvae of *Calliphora* in a corpse may be mentioned. The latter helped the B.S.A.P. to establish the time of death.

The customary advisory lectures were given to students at Gwebi College and a number of advisory talks were given to the Intensive Farmers' and Smallholders' Association. Advisory articles were published in *The Rhodesian Farmer* on maize streak and in the press on control of potato tuber moth.

In the helminthological section, 51 root samples were dealt with. Specimens were received from Northern Rhodesia (23), Southern Rhodesia (18) and Nyasaland (10). Root-knot nematodes were recovered from 50 of the specimens, there being a single instance of *Pratylenchus* sp. infection. The root-knot nematodes involved were *M. javanica* (43), *M. hapla* (5) and *M. arenaria* (2). Blueberries

from the U.S.A. and strawberries and loganberries from the U.K. had soil on the roots infested with plant parasitic nematodes.

PHYTOSANITARY SERVICES

Regulations

No changes were found to be necessary in the regulations affecting the import of plants. The regulations affecting the removal of cotton from pink bollworm infested areas were amended by Federal Government Notice No. 103 of 1961, in order to specify the kind of fumigation treatment which was required and to add the Nyanyadzi Irrigation Scheme to the list of declared infested areas. The date by which growing Turkish tobacco plants must be destroyed was brought forward for Southern Rhodesia to the 1st August by Federal Government Notice No. 354 of 1960. The regulations affecting the sale of nursery stock were rewritten as Federal Government Notice No. 286 of 1961 and the opportunity was taken to modify them in order to permit several alternative modes of fumigation and to simplify the requirements in respect of labelling. Circulars explaining these matters further and in greater detail were prepared and sent to all registered nurserymen.

Plant Inspection

There are no Plant Inspectors in the Northern Territories and the work of plant inspection for these territories is carried out by Customs officers helped, when necessary, by officers of the territorial Ministries of Agriculture or, in Northern Rhodesia, of the Department of Conservation and Extension. No records for these territories are kept nor are they for the smaller ports of entry in Southern Rhodesia where again Customs officers carry out the work. These latter, however, clearly represent a very small proportion of the total imports destined for Southern Rhodesia. At the main ports of entry into Southern Rhodesia, Umtali, Gwelo, Salisbury and Bulawayo, where Plant Inspectors operate, 23,795 consignments, involving 1,397,663 packages, were dealt with, these figures being rather less than last year's. Permits to import plants, issued during the year, totalled 725.

The restrictions on the import of tree seeds introduced last year became fully effective and several such imports were examined. Some of these showed evidence of insect damage and were fumigated before release. Of particular interest were two interceptions of the chalcid wasp *Megastigmus* sp., bred from seeds of *Pinus douglasiana, P. pseudostrobos* and *P. michoacana* imported from Mexico. These were in the larval and pupal states and were still living when intercepted. In North America these insects are sometimes responsible for severe damage to seed crops of *Pinus* spp. They are not known to occur in Africa.

One consignment of Water Hyacinth *(Eichornia crassipes)* was intercepted at Bulawayo and was destroyed in terms of the Noxious Weeds Act. Such interceptions have become very few in recent years and it appears that the public is becoming more aware of the pestilential nature of this plant.

Fruit imported from South Africa was generally of good quality and only one consignment of apples had to be refused entry, because of infestation with codlin moth. Another consignment of apples had a considerable infestation of a mite, *Tetranychus* sp., at the blossom end. This is the first recorded interception of this kind. Most other interceptions were of a routine or regulatory nature and largely involved pea and tomato seed, dahlia tubers, citrus fruit and tobacco samples.

Quarantine

Importations of *Rubus* sp. from Europe and North America are being grown in quarantine for the Senior Horticulturist and banana suckers from Honduras for the Provincial Agriculturist, Manicaland. A proposed import of pine scion material from Central America, which was to have been grown in quarantine for the Southern Rhodesian Forestry Commission, was abandoned because of the unsuitability of the material. A substitute import from Australia is expected shortly. There is an increasing demand for quarantine facilities and the erection of the first quarantine greenhouse, the beginning of the Salisbury Plant Quarantine Station has commenced. This follows a recommendation of the Inter-African Phytosanitary Commission.

Inspections were made and phytosanitary certificates issued in respect of large quantities of citrus fruits exported to Europe from the Umtali area and Hippo Valley. Altogether 189 phytosanitary certificates were issued from the Salisbury office, 12 from the Bulawayo office and 814 from Umtali. A high proportion of the large number from Umtali concerned tomatoes sent to Portuguese East Africa.

On behalf of the Senior Horticulturist, fruit grown in the Eastern Districts was inspected and graded at Salisbury and Umtali.

Cotton grown in the infested areas of the Sabi Valley was again fumigated as a precaution against the spread of pink bollworm. Some of this work was carried out on our behalf by the Officer-in-Charge, Sabi Experiment Station, and the remainder by the Plant Inspector at Umtali.

The number of nurseries registered in the Federation increased to 75 (66 in 1960). A meeting was held with representatives of the Rhodesian Nurserymen's Association and ways of improving the quality of nursery stock were discussed. It was agreed that, in future, an attempt would be made to inspect nurseries more than once a year though it was realized that this might be difficult with some of the less accessible ones. Complaints regarding unauthorized sale of nursery stock and lengthy holding of nursery stock by shopkeepers who were not registered were investigated and cleared up. Following complaints in the Bulawayo area an official explanatory letter was published in *The Chronicle*, Bulawayo. All nurserymen were circulated with instructions on labelling and fumigation and there now seems to be a much better understanding of these matters.

Responsibility for the Tobacco Inspection Service, and the staff concerned, were transferred to the Department of Conservation and Extension. Good progress was made in negotiating for a vacuum fumigation chamber to be set up at Beira. This would deal mainly with tobacco for export but could be used, when necessary, for imports both of tobacco and other commodities.

PUBLICATIONS

1. The susceptibility of clovers *(Trifolium* spp.) and Trefoils *(Lotus* spp.), to the common root-knot nematode *(Meloidogyne javanica).* G. C. Martin, *Rhod. Agric. J.*, vol. 58 (1).
2. Plants attacked by root-knot nematodes in the Federation of Rhodesia and Nyasaland Supplementary List No. 2, G. C. Martin, *Rhod. Agric. J.*, vol. 58 (1).
3. Root-knot nematodes *(Meloidogyne* spp.) in the Federation of Rhodesia and Nyasaland, Supplementary List No. 2, G. C. Martin, *Nematologica,* vol. 6.
4. Insect Pests of Deciduous Fruit in Eastern Districts of Southern Rhodesia, A. J. M. Carnegie, *Rhod. Agric. J.*, vol. 58, No. 4, 1961.
5. A review of Insect Pests infesting crops at Henderson Research Station, C. E. Taylor, *Rhod. Agric. J.*, vol. 58, No. 4, 1961.
6. Maize Streak and How to Control It, D. J. W. Rose, *Rhod. Fmr.*, vol XXXI, No. 42, 1961.
7. Review (by J. A. Whellan), *Flora Zambesiaca,* vol. 1, pt. II, by A. W. Excell and H. Wild.

HORTICULTURE

C. N. HAYTER, *Senior Horticulturist*

HORTICULTURAL PRODUCTION generally continued to increase, both on intensive smallholding schemes and in conjunction with mixed farm cropping. Improved standards of management, together with better marketing presentation, occurred. Competition became more intense and prices for produce to growers—especially vegetables for fresh consumption—were lower than last year.

Greater interest was taken in the horticultural usage of irrigible land and more requests were received for suggestions of suitable crops to grow which could be readily marketed.

CLIMATIC CONDITIONS

Rains were well distributed throughout summer, but overcast weather and little sun played havoc with vegetable crops. Periods of freak late rains brought on more outbreaks of fungus diseases in vegetables and potatoes.

Warm weather continued well into early winter followed by only a few light ground frosts that did no damage. A spell of low night temperatures occurred, however, which lasted well into September and delayed growth.

FRUIT

CITRUS

Crops were good and sold readily on internal markets except when the cold weather was experienced. Prices were lower than last year. Some difficulty occurred with early oranges ripening normally but being very delayed in colouring externally, due to lack of cold in early winter. Navel oranges from the lowveld suffered most, especially from young, strong, growing trees.

Attacks of false codlin moth were much more common than usual and much fruit was infested. Growers were advised to adopt more hygienic measures by regularly collecting and destroying all fallen fruit. Citrus psylla of the foliage was of frequent occurrence where trees did not receive normal routine sprayings.

With more attention being paid to correcting the two most common trace elements deficiencies, zinc and manganese, citrus trees have improved considerably, especially in fruit quality. Some instances of overfeeding with nitrogenous fertilizers were found which were responsible for a rapid build-up of soft scale insect attacks. Under such conditions normal control measures are far less effective until tree vigour is reduced.

Except for the continued large-scale expansion of orange tree plantings at the Mazoe Citrus Estates, other citrus plantings were moderate, growers tending to mark time. Locally-grown nursery trees were in plentiful supply. A commercial Valencia orange planting has been established in the Beitbridge area.

A further trial shipment of almost 4,000 cases of oranges from the Premier Estate, Umtali, was exported to Britain via Lourenço Marques and met with a most favourable reception. Also, the first consignments of grape fruit and oranges were exported from the Hippo Valley Citrus Estate, near Fort Victoria, as trial consignments. The Central Statistical Office returns of citrus trees, as recorded for Southern Rhodesia for 1959–60, were as follows:

	Trees	*Value of Fruit Sold or Processed*
Orange	379,000	£186,000
Other Citrus	90,000	£ 29,000
Total	469,000	£215,000

Exports of concentrated orange juice for 1960 were valued at £125,400, showing a further increase. Essential oils exported—being almost entirely from citrus fruits—were valued at £20,200.

SUB-TROPICAL FRUITS (*other*)

With such favourable climatic conditions and plenty of land and water available, there is scope for more expansion in sub-tropical fruit production. With larger scale units and more specialization for better continuity of supply, this would do much to assist marketing.

Bananas. Little progress was made toward greater self-sufficiency in respect of our Cavendish banana requirements. Lack of access to rail facilities in the low-veld precludes the large-scale plantings needed.

For ease of handling, modern banana-ripening chambers require fruit to be supplied in bunches.

Avocados. A few new plantings were made. Most growers have only small numbers of trees and with the exception of a larger grower at Melsetter who packs named varieties in standard trays, fruit is marketed loose and ungraded. No major difficulties were experienced with tree growth and cropping.

Papaws. Supplies were late coming to market owing to the long winter. In the higher altitudes areas, due to the cold, much fruit was attacked by ripe-fruit-rot disease. From the warmer areas there is room for supplies of well-coloured, early season fruits packed in standard size boxes.

Mangoes. More inquiries were received regarding the commercial possibilities of mango production. As mangoes grow readily in areas where little frost occurs, an expanding home market is available for attractive fruits. Mildew disease was common during the flowering period and caused much flower shedding. It is readily controlled by sulphur dusts or sprays.

Other Kinds. No new interest was taken in pineapple growing and acreages have declined sharply in the last few years. Very few locally-grown fruits were seen on home markets.

Marketing difficulties, currently experienced in the disposal of vegetables, have caused some growers to give consideration to the growing of granadillas. These fruits have been readily marketed at good prices but supplies have been sparse. They are readily grown under irrigation.

Deciduous Fruit

For the second year in succession deciduous fruit trees enjoyed a prolonged spell of low winter temperatures which stimulated spring growth. Bud-burst and flowering were late, which could be due partly to the previous season's extended autumn rain and to warmth delaying defoliation and dormancy.

Standards of management of orchards, and handling of fruit showed continual improvement; greater attention was given to sorting, grading and packing for better presentation.

Further cold storage trials with apples were reasonably successful.

Fruit Crops. Apple crops were light and there was no need to restrict importations after harvesting ended in March. There were good crops of peaches, and plums were in very heavy supply.

Hail in November caused considerable damage to apples at a large orchard at Melsetter.

Marketing. The Eastern Districts Fruit Pool handled the bulk of deciduous fruits for the fresh fruit market. Some difficulty was experienced with the handling and disposal of the extra large plum crop; embarrassment being caused by the quantity of small size fruits sent in. The Nethley variety of plums was responsible for this, as unless well thinned out, it gives small fruit which is not popular once the larger Santa Rosa plums start to arrive on the market.

Various meetings of growers were held at Umtali and Salisbury to consider improved marketing and distribution of deciduous fruit. The Plant Inspectors at Umtali and Salisbury Railway Stations carried out inspections of Pool Members' fruit consignments throughout the season.

Fruit Plantings. At the annual meeting of representatives of the Growers', the Sunrho factory and the Ministry, held at Umtali, an assessment was made of plantings in relation to fruit supplies and requirements. It was found that, both for the fresh fruit outlet and for processing, far more apples were needed. Apricots are sparsely grown while canning peaches are overplanted in terms of what the Umtali factory can market at the present time. Some trees are being budded-over to dessert peaches. More strawberries are needed by the factory.

Viticulture. While the growing of grapes is still of popular interest, much of the novelty of such trial plantings by small growers has diminished. Supplies of fruit to markets have been very small in spite of there being about 110 acres established.

Commercial quantities of wine were produced by one Rusape and one Salisbury grower and were placed on the market.

Deciduous Fruit Tree Returns. Statistical recordings of deciduous fruit tree populations for 1959–60 for Southern Rhodesia are as follows:

Apple	65,800
Peach	76,600
Plum	22,000
Pear	4,200
Apricot	2,500
Total	171,100

Planting of apples and peaches showed the main increases.

Fruit Importations. Federal imports of the various kinds of fresh fruits for 1960 were as follows:

	Tons (2,000 lb.)	£
Apples	2,974	181,200
Plums	253	14,800
Grapes	1,724	83,300
Deciduous (other)	1,657	93,300
Bananas	6,120	74,000
Citrus	1,028	18,100
Sub-tropical (other)	528	19,900
Fresh Fruit (other)	672	21,100
Fruit (preserved)	2,272	260,700
Total	17,228 tons	766,400

This clearly indicates the scope existing for a greater measure of fruit production for the home market of the Federation.

TEA

Tea growing continued to expand, there being a recorded acreage for 1959–60 of 3,560 established in Southern Rhodesia, of which 3,130 acres are in production. The yield totalled 2,195,500 lb. of which some 46,000 lb. was exported. The tea growing is confined to the higher rainfall areas of Chipinga and Inyanga.

COFFEE

Considerably extended coffee plantings have taken place in the Chipinga, Melsetter and Umtali areas with many new seed-beds and seedlings to follow on.

Recorded acres for 1959–60 were 308 of which 114 are in bearing. A yield of 11,200 lb. was obtained. Only Arabica coffee is grown. Some overbearing occurred. Trials are under way with Kenya selections.

A Rhodesian Coffee Growers' Association was formed. Trial parcels of coffee were exported and were well received. So far no coffee rust disease has been seen.

VEGETABLES

Fresh Vegetables

A marked expansion of fresh vegetable production occurred, which for Southern Rhodesia increased by 642 acres from 1959–60, to a total of 5,942 acres. The value of such crops was £397,700 of which production for canning was valued at £81,600.

Climatic conditions were mixed and had a varied effect upon production and marketing. The summer crop suffered considerably due to heavy rains, high humidity and lack of sun. Fungus diseases were rife. It became necessary to fall back on importation of fresh vegetables from South Africa for several months.

Outbreaks of bacterial canker in tomatoes made their first appearance, and in an attempt to stamp out the few occurrences at Salisbury, crops were destroyed on Government Order and compensation was paid. As more outbreaks followed in other areas, no further control was possible. Later in the season attacks of mosaic virus disease were responsible for more tomato crop losses.

As there was no frost to damage crops, markets subsequently were very heavily supplied with all kinds of seasonal vegetables and market prices were much lower than usual.

While the industry at Umtali can still absorb greater quantities of peas for canning, there has been more interest in using them for deep freeze processing, with lesser quantities of other vegetables. Such processing is also being carried out at Salisbury and Beatrice.

Onions. There was a decrease of almost 100 acres of onions grown in Southern Rhodesia, but crops reaped were only slightly lower by about 1,000 bags, at 22,384 bags (120 lb.). The "Cape Flat", and selected varieties from it, still proved to be the most satisfactory.

Where crops have been well grown and correctly harvested storage on the farms has been possible until the end of February. The 30 lb. pocket is the standard container now in use for marketing dry onions.

Protection of the home market extends from August to February inclusive.

Vegetable Research

It was possible to extend the vegetable research work at the Henderson Research Station, Mazoe, which is carried out in co-operation with the Station's Agronomists. Nutritional studies on onions and cauliflowers were continued, as was work on tomatoes. The water requirements of peas and onions were being investigated, as well as onion storage. Trials with American onion hybrids were most promising. The results of such research are presented in reports from the Henderson Station.

Vegetable Exports

Much of the processed vegetables from the Umtali area were for export. Exports for 1960 were as follows:

	£
Dehydrated	124,800
Canned	2,400
Total	127,200

Vegetable Importation

Federal imports of fresh vegetables for 1960 were again much reduced, the tonnage being almost half that of the previous year. There are still further possibilities for bringing about greater reductions, especially in the Bulawayo area.

In respect of frozen and other preserved vegetables these imports are very considerable and persistent. There is much scope for a far greater local share of the home market.

Imports of onions were increased, due largely to local crops being delayed and short in the previous year.

Details of importations for 1960 are as follows:

	Tons (2,000 lb.)	£
Fresh Vegetables	943	31,200
Frozen	233	47,100
Preserved (other)	1,284	173,600
Onions and Garlic	2,653	99,700
Totals	5,113	351,600

ESSENTIAL OILS

Some small scale investigational work was carried out on geraniums for oil extraction. Many requests were received for general information on growing various crops for essential oils.

NURSERIES, PLANTING MATERIAL, CUT FLOWERS

For the current year in Southern Rhodesia there were 61 registered nurseries, 21 of these being situated in the Salisbury area. Due to the decline in new buildings and in immigration, the nursery trade was on a much reduced scale.

Importations of trees, shrubs, bulbs and other planting material for the Federation were valued at £43,200, which was almost equal to last year. Imports of cut flowers at £10,100 were much the same as the previous year.

HORTICULTURAL SERVICES

Requests for all kinds of horticultural services were as numerous as ever. This well illustrates the useful part the Horticultural Branch is playing in the agricultural industry. Unfortunately, due to staff limitation, it was totally impossible to deal with many of the requests received, more especially for specialized advisory visits to farmers and growers.

To make the country more self-sufficient horticulturally, for which tremendous scope exists, it is essential that more extended services are readily available. When it is realized that horticulture covers hundreds of different crops—many of them highly specialized—even to keep in touch with production techniques on the technical side and research work in the horticultural world, is quite a problem.

A more recent trend, which is increasing, has been the approach for information from the technical field staff of the fertilizer and pesticides companies, on behalf of their customers.

Co-operation with officers of the Department of Conservation and Extension was well maintained both at Head Office and throughout the regions. Much assistance and technical information was provided, and joint visits were paid to several farming areas. Various horticultural talks and demonstrations were given on their behalf. The Northern Rhodesia Conservation and Extension Annual Conference was attended.

Six lectures on fruit and vegetable production and marketing were given to senior students at the Gwebi Agricultural College. Numerous other such talks and demonstrations were given to other organizations.

The Horticulturists served on various technical committees during the year.

Horticultural Articles

A number of articles on fruit, flower and vegetable production were written for the agricultural press, and information on these subjects was provided at interviews. A series of special crop articles were written for the proposed Conservation and Extension Agricultural Hand-book.

Numerous articles were received from other writers for criticism and comment prior to publication.

SHOW JUDGING

Fruit, flowers and vegetables were judged at agricultural and/or horticultural shows at Bindura, Bulawayo, Glendale, Salisbury, Sinoia, Umtali, Umvukwes and Wankie. The standard of exhibiting was generally quite high, with competition fairly good.

OFFICIAL VISIT

While on an official tour to various countries of Africa, the leader of the Fruit and Vegetable Section of the Tropical Products Institute, London (Mr. E. H. G. Smith), was able to spend a week in Southern Rhodesia. A comprehensive series of visits and interviews were possible and much benefit was obtained from his experience and knowledge.

THE AGRICULTURAL EXPERIMENT STATION, SALISBURY

A. G. H. RATTRAY, *Officer-in-Charge*

SEASON

THE STATION experienced an exceptionally favourable season, with a well-distributed rainfall of 36.32 in. over a long growing season and with temperatures above average in March. A soaking rain fell on 11th November and planting, started the following day, continued almost without interruption. Under such ideal conditions maize thrived and, for the first time in the history of the Station, a plot yield of over 50 bags an acre was recorded in one of the trials. The incidence of leaf blight, *Helminthosporium turcicum*, was light but, with the rains continuing throughout March and the first half of April, conditions were favourable for the development of the "cob rots" on the ripening ears and selection for resistance was possible in all the nurseries. Although the amount of streak, Zea Virus 2 Smith, was not high by general standards, it was more apparent than in previous years and the increase in the number of plants attacked is viewed with great concern. Attempts have been made to reduce the vector population by spraying the ripening wheat and any other vegetation remaining green at the end of the winter. The summer wheat crop grew well but a severe outbreak of stem rust, *Puccinia graminis*, affected susceptible varieties to such an extent that yields were negligible. Harvesting of the 1961 winter crop is not complete at the time of writing this report but the general level of yields is higher than in 1960. Particularly heartening is the fact that a commercial crop of almost 20 bags an acre has been grown on Lowdale Farm from two of the varieties developed by the Wheat Breeder. Potatoes, too, enjoyed the favourable weather and, with early planting, and late blight, *Phytophthora infestans*, appearing later than expected, yields were higher than for many years. Legumes fared erratically; soya-beans eventually gave high yields, but sunnhemp was very poor.

FERTILITY TRIALS

In the season under review one of the most interesting of the fertility trials was that concerned with the residual effect of management and nitrogen treatments of a grass ley, after the ley is broken and planted to arable crops. A Panicum Makarikari ley ploughed early in February 1960, after receiving various treatments for five seasons, was planted to maize in 1960–61 for a first measurement of the residual effect of these treatments.

Grass Management Treatments

A = Grazed.
B = Cut for hay and the hay removed (two cuttings a season).
C = Cut and the grass spread over the plots as a mulch (cut at the same time as B).

Grass Nitrogen Treatments

(1) = No nitrogen.
(2) = 80 lb. N.
(3) = 160 lb. N per acre per annum.

This nitrogen was applied in two equal dressings each season: soon after the first good rains and again after the first cutting for hay.

Nitrogen Treatments to Maize

(1) = No nitrogen.
(2) = 60 lb. N.
(3) = 120 lb. N per acre.

Applied as calcium ammonium nitrate and ploughed under in October 1960.

YIELDS OF GRAIN (in bags of 200 lb. per acre)

	N1 (Maize)	N2 (Maize)	N3 (Maize)	Mean
N1 (Grass) . . .	7·51	16·05	22·18	15·25
N2 (Grass) . . .	10·86	16·91	19·93	15·90
N3 (Grass) . . .	17·34	20·61	20·93	19·63
Mean . . .	11·90	17·86	21·01	

In this first season of measuring the residual effect of the treatments given to the ley, it will be seen that the nitrogen applied to the maize direct has produced, on the average, a far larger response than a much greater quantity of nitrogen applied to the ley over the five seasons of treatment. Nevertheless, where no nitrogen was applied to the maize, the residual effect of the nitrogen to the grass was considerable. The differences in yield following the three grass management treatments were not large enough to be significant statistically, although the yield from the grazed plots was 17.49, compared with 16 bags per acre from the B plots, which were cut for hay. It is likely that this difference of 1.49 bags per acre would have been greater had not the grazing animals been removed from the plots at night.

Stubble Mulching and Trash Farming

In recent years Rhodesian farmers have become increasingly conscious of the value of maize stover in maintaining or building up soil fertility and a trial was laid down in 1954 to compare a number of methods of using the stover.

Crop Residue Treatments

A = Control. All residues removed.
B = Residues ploughed back (trash farming).
C = Residues left on the surface as a stubble mulch.
D = Residues removed and a dressing of two tons of kraal compost per acre ploughed back.

YIELDS OF GRAIN (in bags of 200 lb. per acre)

Season	Crop	Rainfall (in.)	A	B	C	D
1954–55 . .	Maize	39·48	20·36	21·03	18·86	22·79
1955–56 . .	Maize	40·00	19·93	21·68	20·51	22·12
1956–57 . .	Maize*	30·03	29·40	31·29	27·07	31·10
1957–58 . .	Maize	28·52	18·20	19·48	15·85	19·39
1958–59 . .	Soyas	30·14	6·51	7·59	7·62	7·18
1959–60 . .	Maize*	21·68	16·64	16·27	18·80	17·20
1960–61 . .	Maize*	36·32	38·47	42·17	36·97	41·10
Mean Maize Yield . . .			23·83	25·32	23·01	25·62

* Variety = 58H1 In other years 52D.H. 32.

In this trial all treatments receive the same amount of nitrogen, 100 lb. per acre per annum, with the exception that the soya-beans in 1958–59 were given no nitrogen and the application was reduced in the year after the soyas to 80 instead of 100 lb. per acre.

A comparison of treatments A and B, over the six seasons in which the trial has been planted to maize, shows the benefit from ploughing back the stover as 1.49 bags per acre per annum. There are indications that the cumulative effect of ploughing back the residues is widening the margin: this trend is more pronounced in the results from the long-term rotation plots on Block 31. By contrast, the effect of leaving crop residues on the surface of the soil as a stubble mulch has been to reduce yields: the mean figure is .82 bags per acre. The object of the mulch is to protect the soil from weather eroding forces and to ensure better penetration of rainfall and less run-off; and it would appear that in a season of drought, such as 1959–60, this conservation of the rainfall does have a beneficial effect on yield. It is possible that stubble mulching would pay more immediate dividends in the marginal rainfall areas, where dry spells of weather occur more frequently than in Salisbury.

Finally, it seems that where the stover is used as food or bedding for farm livestock and the resultant animal manure or compost returned to the land, the effect on yields is very similar to that obtained from ploughing the stover straight back.

MAIZE

Breeding

Eighteen variety trials were conducted throughout Southern and Northern Rhodesia either on research stations or on farms where they were supervised by officers of the Department of Conservation and Extension. In most instances, these trials were of randomized block design with five replicates, but in certain cases they consisted of duplicated demonstration plots. In nearly all areas yields were well above average and only three trials failed to produce valid results. Eight

varieties were included in the randomized block trials; the open-pollinated variety Southern Cross, the three double hybrids SRH No. 10, No. 11 and No. 12, the two single hybrids SRH No. 51 and No. 52, and two single hybrids not yet released for commercial planting. The two latter were excluded from the demonstration plots. The following are the mean yields from all the trials.

MEAN YIELDS OF GRAIN (in bags of 200 lb. per acre)

	South-ern Cross	SRH No. 10	SRH No. 11	SRH No. 12	SRH No. 51	SRH No. 52	58 H6	60 H15
Mean of 11 trials .	28·21	29·37	30·41	33·51	32·60	38·80	35·88	30·11
Mean of all trials .	26·44	27·21	29·11	32·05	30·55	36·77	—	—

The 11 trials, the mean yields from which are given in the upper row of figures, are those of randomized block design.

Of the five hybrid varieties available for commercial planting, the single hybrid SRH No. 52 (N3–2–3–3 × SC 5522) proved outstanding in almost every trial and received favourable reports from farmers who used it commercially. In certain instances it was damaged by Fusarium ear-rot to a greater extent than the other hybrids but it is hoped that in more normal seasons it will not prove appreciably more susceptible. It is intended to select the inbred SC 5522 very carefully for resistance to these diseases. SRH No. 12 gave the highest yields of the three double hybrids and can be recommended for all the higher rainfall areas although its superiority may not be so pronounced in less favourable seasons. Both SRH No. 12 and SRH No. 52 are slower-maturing varieties than any of the hybrids previously released to farmers but both are slightly quicker than Southern Cross. During the growing season SRH No. 12 appeared more sensitive to soil acidity than other varieties; this sensitiveness was noticed on the station and on farms but had not been apparent in 1959–60, possibly because of the drier conditions.

A new series of double hybrids of similar maturity rating to SRH No. 10 and No. 11 have been made experimentally for testing. These double hybrids make use of inbred lines developed from material of Mexican and Natal origin and will have much-improved resistance to *Helminthosporium turcicum*. Seed of Mexican 155, a strain highly resistant to *H. turcicum*, in which the resistance is attributed to a single dominant gene, was obtained from Pretoria and crosses were made with A5–7–6. It is hoped to transfer resistance to A5–7–6 and back-crossing will be started in the coming season. A large number of new selections from open-pollinated Southern Cross were selfed for the first time.

Population Trials

For several years the variety 51H37 (N3–2–3–3 × A5–7–6) has been tested at a range of population and fertility levels. More recently a trial has been started to obtain information on the reaction of tall, slow-maturing, and short, quicker-maturing varieties, to population level and to time of planting. From the information available it is obvious that the optimum population is not the same for all varieties. Accordingly, the trial with 51H37 is to stop and will be replaced by a trial in which several varieties, including those in use commercially, will be compared at five population levels. The following are the results of the trial to be discontinued.

YIELDS OF GRAIN (in bags of 200 lb. per acre)

Season	1955–56	1956–57	1957–58	1958–59	1959–60	1960–61	Mean
Rainfall (in in.) . .	40·00	30·03	28·52	30·14	21·68	36·32	
3 ft. × 18 in. . . .	19·90	23·68	30·33	28·96	23·25	33·88	26·67
3 ft. × 15 in. . . .	20·60	26·83	34·07	32·17	23·18	38·16	29·17
3 ft. × 12 in. . . .	20·70	27·87	37·40	34·80	23·97	42·50	31·21
3 ft. × 9 in. . . .	19·50	28·32	36·25	34·66	23·72	46·42	31·48

Over the six seasons the variety 51H37 has given the highest yields at the spacing 3 ft. × 12 in. (14,520 plants per acre) and 3 ft. × 9 in. (19,360 plants per acre). But only in the extremely favourable 1960–61 season has the higher population rate given a significantly higher yield and, in fact, in four of the six seasons it has given slightly lower yields. On the basis of these results the spacing 3 ft. × 12 in. is recommended. It is noteworthy that, in the very dry season 1959–60, although there was no advantage gained from the higher population

rates yet there was no harmful effect. It had been expected that in a severe drought a reduction in yield would eventuate if high plant populations were used.

Various observations have been made in conjunction with this trial. Bushel weight of the grain harvested has been slightly lower from the high population plots but at the yield-levels obtained the differences have been negligible. Lodging counts have shown that high plant populations are liable to result in increased lodging.

PERCENTAGE OF LODGED PLANTS (Mean of Five Seasons)

3 ft. × 18 in.	3 ft. × 15 in.	3 ft. × 12 in.	3 ft. × 9 in.
6·3	8·5	13·0	24·3

In the second of the two population trials conducted in the season under review, four varieties were yielded at three dates of planting, and at three plant population rates, with the following results.

YIELDS OF GRAIN (in bags of 200 lb. per acre)

	60H16	51H37	59DH2	58H6	Mean
3 ft. × 18 in. . . .	31·16	34·64	33·29	35·95	33·76
3 ft. × 15 in. . . .	31·54	35·56	34·13	37·20	34·60
3 ft. × 12 in. . . .	34·05	39·01	36·30	38·15	36·87
Mean . . .	32·25	36·40	34·57	37·10	
14.11.60	34·49	38·80	36·37	39·42	37·27
28.11.60	32·44	39·69	37·11	39·51	37·19
12.12.60	29·80	30·70	30·21	32·34	30·76
Mean . . .	32·25	36·40	34·57	37·10	
	3 ft. × 18 in.	3 ft. × 15 in.	3 ft. × 12 in.	Mean	
14.11.60	37·06	36·18	38·57	37·27	
28.11.60	35·58	37·40	38·59	37·19	
12.12.60	28·61	30·22	33·46	30·76	
	33·76	34·60	36·87		

Of the four varieties, 60H16 is the shortest and quickest maturing and 58H6 is the tallest and latest. 59DH2 is just a few days earlier than 58H6 and 51H37 is intermediate. Although 60H16 has given the lowest yields at all three dates of planting, it compares more favourably at the latest date and, as was to be expected, suffered least from the delayed planting. Interactions between variety and date of planting were not statistically significant; it had been anticipated that the short variety would benefit to the greatest extent by an increase in population.

Although the interaction between spacing and date of planting is not statistically significant, there is an indication that the reduction in yield, as a result of later planting, is less marked at the closer spacings. It will be interesting to see whether similar results are obtained in future years and whether it is necessary to use higher population rates for late planting.

Application of Nitrogenous Fertilizers

The response to fertilizer nitrogen in 1960–61 was, in most investigations, small. In such a favourable growing season, with the level of yields so high, much larger responses were anticipated. For instance, in the main nitrogen trial the control plots, receiving no nitrogen, yielded 37.45 bags whilst the plots receiving 100 lb. of nitrogen per acre averaged 41.08 bags, an increase of only 3.63 bags an acre. As the residual effect of applications of nitrogen made the previous year was small, judging by results from the residual nitrogen trial, it must be presumed that the season was ideal for the mineralization of soil nitrogen. A yield of 37.45 bags an acre from the second successive maize crop after a leguminous green manure is quite exceptional when obtained without the application of any nitrogen.

LEGUMES

The growth of, and yields from, legumes on the Station was variable. Sunn-hemp grew very poorly and provided only small quantities of green material for ploughing back but early planted *Crotalaria ochroleuca* did very well. In practice, *C. ochroleuca* is unsuitable as a farm green manure because, in the initial stages, it grows very slowly and is unable to overcome competition from weeds. By

comparison, sunnhemp grows quickly to start with and it is intended to sow a mixture of the two for trial purposes in the coming season. It is hoped that a small proportion of sunnhemp plants will overcome weed competition in the early stages and that the bulk of the final growth of green material will be provided by the *C. ochroleuca*, which is resistant to the Colletotrichum stem-break fungus attacking sunnhemp.

Soya-beans yielded well although, in the early part of the season, they looked yellow and short of sunshine. No cow-peas were planted and velvet-beans gave rather lower yields than expected. Trials with a number of varieties of edible beans, at two spacings and two dates of planting, gave higher yields than in previous years. The highest was from sugar-beans, just under eight bags an acre. In some cases stands were incomplete and it seemed likely that a higher plant population was required. All varieties gave higher yields in rows 18 in. apart than in rows 24 in. apart.

KENAF (*Hibiscus cannabinus*)

This crop grew very well in a trial designed to test out various spacing and fertilizer treatments. The only differences between treatments of any magnitude were those between spacings which were statistically significant. A spacing 6 in. × 3 in. gave an increase in yield of green material of 15.8 per cent. over a spacing of 18 in. × 3 in. The response to phosphates and potash was negligible but there was a small response to nitrogen which was significant. Facilities are not available on the Station for the retting of large quantities of material but, on the basis that 5 per cent. of the green material is fibre, yields of fibre were well over a ton per acre.

WHEAT

The summer of 1960–61 will be remembered for the very severe attack of stem rust, the worst experienced on the Station. A change in the prevalence of races of rust resulted in varieties such as S29A1, which had previously given high summer yields, being seriously damaged. It emphasized the unreliability of summer wheat production. However, a new variety, S76A9, to be called Marodzi, yielded 10.9 bags per acre in the variety trial and is being bulked for release to farmers. It is thought that this variety will be particularly suitable for growing on soils of lower fertility under conditions for which Punjab was well adapted. The International Rust Nursery collection, comprising 547 samples, was grown in the summer and several hundred strains proved highly resistant to all four races of rust present. In fact, this nursery is proving a most useful source of new material for the breeding programme.

The 1960 winter crop gave yields a little below expectation, probably because it was sown on land which had just grown summer maize. The 1961 winter crop, which is being harvested and threshed at present, follows a legume hay and is giving excellent yields. The main 1960 trial included eight varieties which were compared at two drill spacings with the following results:

YIELDS OF GRAIN (in bags of 200 lb. per acre)

Spacing	F260A1	F260A1D1	S29A1	F260A1B3	S20A2A1	S29A1A5	Yaktana	Punjab 8A
6″ × 3″	19·9	19·9	19·6	19·4	18·8	19·3	14·9	12·1
12″ × 1½″	21·3	21·6	17·7	17·9	18·7	15·0	17·4	10·5

Of the results available from the 1961 winter crop the most interesting is that some of the very short-strawed types, developed from dwarf Japanese material, have given yields equal to those from the better tall varieties. The cost of the irrigation is the most important single item in the production of winter wheat. By the liberal fertilization of varieties capable of high yields it is hoped to reduce the cost (per bag of wheat) of this irrigation and thus make the growing of winter wheat an economic proposition. It is essential that the varieties grown are capable of standing up under high fertility conditions and therefore resistance to lodging and strength of straw is being given high priority in the breeding work.

POTATOES

Good planting rains and regular falls throughout the growth period gave rise to vigorous growth and high yields. In spite of high rainfall and humidity, late blight *Phytophthora infestans* appeared late in the season and did not reduce yields as much as might have been anticipated.

Breeding Programme

The provision of facilities at Inyanga for the propagation of virus-free stocks has enabled the breeding programme to progress satisfactorily. Some 2,000 seed-

lings, derived from crosses made during the 1959 - 60 season, were raised and planted out at Salisbury during the first week of January. From these approximately 130 have been selected for further trial.

Unfortunately, a severe outbreak of Leaf Drop Streak (potato virus Y) occurred among the seedlings and, to avoid further loss of valuable material in the future, arrangements have been made for the seedling raising to be carried out at Inyanga.

A further series of crosses were made during the growing season.

Variety and Seedling Selection

A wide range of material from various sources, including the United Kingdom, Holland, Germany and Mexico, was planted in observation plots. A number of promising varieties and seedlings were selected for further trial.

Variety Yield Trial

High yields were obtained in this trial. The blight-resistant varieties Loman 43–35 and Walanga yielded 168 and 136 bags per acre, respectively, while Up-to-Date gave a yield of 103 bags per acre.

Fertilizer Trial

Applications of kraal compost, potash and phosphate significantly increased yields. A significant negative interaction between kraal compost and nitrogen was observed.

Significant effects of treatments on the percentage dry-matter content of tubers were recorded. Kraal compost significantly increased dry-matter percentage.

GENERAL

Mr. S. W. Nelson was appointed to the staff of the Station at the beginning of the year as a plant breeder and is working on maize. Mr. J. G. de Zwaan resigned in May to take up an appointment in the Republic of South Africa.

Mr. Montague, the Potato Breeder, attended the International Symposium on the Production and Certification of Seed Potatoes, sponsored by F.A.O., which was held at Wageningen, Holland, from 12th June to 1st July, and presented a report on his return.

A potato field-day was held early in February and once again was well attended. Visitors were shown the trials in progress and were given a demonstration of the methods being used in the breeding programme.

The staff of the Station continued to supervise the production of seed of inbred and single hybrid maize varieties to be used in the production of commercial seed. This involved a large number of visits to farms to rogue out off-type plants during the growing season and to supervise the sorting of ears at harvest time. The Wheat Breeder did a certain amount of roguing where seed of his new varieties was being bulked on farms.

The Officer-in-Charge continued to serve on the Executive Committee of the Seed Maize Association, the Field Experimentation Committee (with Mrs. N. Fitt), the Fertilizer Advisory Committee and the Committee for the Maize and Agricultural Produce Sections of the Rhodesia Agricultural and Horticultural Society. He also served on committees appointed by the Secretary to report to him on soya-bean production and on sunflower production in the Federation. For these committees he prepared summaries of research work conducted on these crops. The Potato Breeder continued to serve on the Ministry's Show Committee, as secretary of the Departmental Potato Committee and was responsible for the plant breeding exhibit at the Salisbury Show.

PUBLICATIONS

A. G. H. Rattray

1. Maize Variety Trials — The Results. *Rhod. Fmr.*, 3rd November 1961.
2. The Value of Maize Stover. *Rhod. Agric. J.*, November–December 1961.
3. Results of Experiments, Season 1959–60. *Rhod. Agric. J.*, May–June 1961.

O. J. Olesen

1. Winter Wheat has good Prospects. *Rhod. Fmr.*, 4th August 1961.

In addition, Mr. V. J. Montague prepared an advisory leaflet on seed potato production for members of the Seed Potato Association and a report on three years of potato variety trials for members of the Department.

GATOOMA RESEARCH STATION

A. H. McKINSTRY, *Officer-in-Charge*

RAINFALL AND CROPS

IN MARKED CONTRAST with the previous season, which was one of very poor rainfall, only 17.16 in. being measured, the 1960–61 season proved to be in the end one of the most favourable, with a rainfall of 29.66 in.

Planting of the main cotton and maize experiments and bulks took place from 14th to 18th November 1960, inclusive. Trials and bulks of some other crops such as groundnuts, soya-beans and sorghum were sown from the 5th to 16th December. Between these two planting periods soil moisture and rainfall were only just sufficient to support the first-sown seedling crops. Yet another period of moisture stress in crops occurred towards the end of February and early in March 1961, due to poor rainfall. Thereafter rainfall from about mid-March to mid-April was very favourable for the end-of-season development of crops.

Yields from the main crops grown as bulks were exceptionally good. Maize yields ranged from 18 to 27 bags per acre, cotton treated with insecticide from 1,500 to 2,500 lb. seed-cotton per acre (while cotton not so treated produced only 150 to 500 lb. seed-cotton per acre). Groundnuts yielded 35 bags of unshelled nuts per acre. Yields from several experimental plots were even higher, as will be seen in this report.

The more serious infestations of pests, diseases and parasites which occurred were: witchweed in maize was much more extensive than usual; American bollworm generally was more prevalent in maize and cotton; and severe infestation of a mosaic-like disease resulted in very poor yields in cow-peas.

For the purpose of record, monthly rainfall figures and sunshine in hours-per-day are given in the following table:

RAINFALL AND SUNSHINE RECORDS: FOR THE PERIOD OCTOBER, 1960, TO APRIL, 1961, INCLUSIVE

(Figures in brackets are for 1959–60)

Month	*Total rainfall (inches)*	*Rainless days*	*Longest period without rain*	*Mean sunshine hours per day*
October 1960	0·68 (0·52)	28	15	10·5 (10·3)
November 1960	2·93 (1·47)	10	4	5·3 (7·61)
December 1960	6·55 (7·83)	9	2	6·4 (4·85)
January 1961	8·87 (0·52)	14	5	5·5 (9·14)
February 1961	2·59 (4·62)	8	7	7·5 (6·79)
March 1961	4·67 (1·29)	13	3	6·6 (9·28)
April 1961	3·37 (0·91)	20	18	8·3 (7·59)
	29·66 (17·16)			

COTTON PLANT BREEDING

Mr. F. E. M. Gillham, Plant Breeder, left Gatooma in August 1960 for study leave at North Carolina State College, United States of America. He will not return to Gatooma until October 1962. Meanwhile, the essentials of the cotton-breeding programme are being continued by the Agronomist, Mr. J. M. Burton.

DISTRICT VARIETY TRIALS

Cotton district variety trials were grown in eight centres in Southern Rhodesia, comparisons being made between nine strains, seven of which were Gatooma 1958 selections, the remaining two being Albar 637 and G52/36. Plant spacing in the trials was 3 ft. 6 in. × 12 in. × 1 plant, the equivalent of 12,446 plants per acre. Insecticides were applied in all trials.

At three of the centres, Henderson Research Station (Mazoe), Umshandige (Fort Victoria), and Odstock Farm (Umtali North), limited supplementary irrigation was given when required. Mean yields of the nine strains at these three centres, in the order given, were 614 lb., 696 lb. and 773 lb. of clean *lint* per acre.

Yields obtained from two similar trials grown under dry-land conditions were in lb. *lint* per acre: at Gatooma Research Station, 611 lb.; Fort Victoria (Central), 496 lb. A third dry-land trial at Mount Darwin was a failure.

At the remaining two centres, Sabi Experiment Station and Nyanyadzi, the trials were grown largely under irrigation, and the mean yields were 1,083 lb. and 810 lb. *lint* per acre, respectively.

Albar 637 did not feature amongst the top four yielders at any of the centres in Southern Rhodesia. S58/74 and S58/76, both Gatooma selections, were consistently high-yielding at all centres. Strain S58/252 was by far the lowest yielder in all the centres in which it was grown, in both Southern and Northern Rhodesia.

Seven district variety trials were grown in Northern Rhodesia, the results of six in terms of the mean yield of lint per acre were: Munyumbwe, 553 lb.; Katapola, 476 lb.; Chama, 599 lb.; Mumbwa, 807 lb.; Mount Makulu, 574 lb.; Mount Makulu (second trial), 526 lb. Albar 637 appears amongst the top three highest yielding varieties in only two of the six centres in Northern Rhodesia.

Cotton Observation and Seed Multiplication Plots

One hundred and thirty-eight different strains and varieties of cotton, including strains from the U.S.A., were planted at Gatooma, and 46 of them were also sown at the Sabi Valley Experiment Station. All plots were treated with insecticides.

The American varieties were particularly impressive with their large bolls—averaging 8 gms. per boll compared with the Albar 637 which averaged 4.1 gms. per boll. Also the two top-yielding American varieties Arkot and Acala each gave the highest ginning outturn of 37 per cent. Acala, one of the highest yielding of the 138 varieties, will be included in a variety trial in the 1961–62 season.

The overall mean yield of the observation plots which occupied 8.6 acres was 1,573 lb. seed-cotton per acre, at the low plant population of 8,300 plants per acre, the plant spacing and density being 3 ft. 6 in. x 18 in. x 1 plant.

S57/77, a Gatooma selection, gave the highest yield of 2,141 lb. seed-cotton per acre which is equivalent to approximately 714 lb. *lint* per acre, this at the wide spacing under dry-land conditions.

Cotton Lint Tests

A report on fibre and spinning tests conducted at the Shirley Institute on 1959–60 lint samples at a count of 40s reads: The irrigated samples were longer, more mature, finer and of higher fibre strength than the corresponding dry-land samples. Albar 637 was the most mature and the coarsest of the four replicated strains. S58/252 was coarser and slightly weaker in the stelometer test than the other two S58 strains (i.e. S58/76 and S58/88) and spun the weakest yarn of the three. The results of yarn tests were largely as would have been expected from the measured fibre properties.

COTTON INSECT PESTS CONTROL

The following information has been obtained from the Research Entomologists, Cotton Pests Research Scheme.

Biological Studies

Detailed observation on the behaviour and natural mortality of the various stages in the life cycle of *Heliothis armigera* and *Earias* sp. have been investigated, and results may be compared with those obtained for *Diparopsis* during the 1959–60 season.

In contrast to the relatively few transfer movements of *Diparopsis* larvae, which invariably occur during the hours of darkness, *Heliothis* attacked a large number of buds and bolls, and all movements over the plant occurred at any time during the 24-hour period.

Earias, like *Diparopsis,* tended to show definite periods over which major movements occurred, but such movements were usually confined to the hours of daylight.

Earias, like *Heliothis,* attacked and damaged a far greater number of buds and bolls per larva than *Diparopsis.*

Studies on the formation of *Diparopsis* over-wintering pupae and the period of subsequent moth emergence were carried out at various centres in the Federation. Results at Gatooma again confirmed a rise in the proportion of over-wintering pupae from some five per cent. of the larvae pupating in March to 100 per cent. by the end of April. At Chitala and Makanga, collections of fifth instar larvae were confined to April, May, and June for which the proportions were 69 per cent., 77 per cent. and 94 per cent., at Chitala, and 59 per cent., 70 per cent. and 60 per cent. at Makanga. In the Sabi Valley the proportion appeared to be below 13 per cent. until the middle of April after which there was a sharp rise to 50 - 71 per cent. for collections to the end of May.

Moth emergences from these centres generally extended from August/September to April, but whereas there is a broad emergence pattern with maximum emergence occurring from the end of November to middle of January at Gatooma, at Chitala there was a *definite* peak in March and at Makanga one in January. Owing to the total number of emergences being low, no peak could be ascertained for the Sabi.

Experiments on the effect of temperature on pupal development indicated that maximum development occurred at 75 degrees Farenheit, while at lower or higher temperatures development was retarded or suppressed to a greater or lesser degree.

Under mulches, soil remained wet throughout the season, and suppression of pupal development occurred, the extent depending on the thickness of the mulch, the degree of wetness increasing with thickness of mulch.

Chemical Control

(a) *Toxicity Tests.* Continuous observation bioassay tests, with *Diparopsis* 1st instar larvae, have been directed mainly at assessing the persistence of Sevin spray deposits under various conditions. Under laboratory conditions Sevin persists on cotton plants with little decrease in efficiency over a period of at least thirty-five days. When subjected to sunlight but no rain, deposits of Sevin remained active for a period of over twenty days, there being little or no breakdown due to ultra violet light. The effectiveness of Sevin (formulated as 85 per cent. sprayable powder) is, however, reduced considerably by rain, the extent and rate of loss depending on the amount and intensity of the rain, and the size of the plant. Small, more open, plants are more subject to rainwash than larger plants where the upper leaves protect the inner framework of the plant. The possibilities of adding some type of "sticker" to increase spray retention is being investigated. Persistence of spray deposits has also been studied in relation to plant growth. The rate of plant growth, especially during the early part of the season, makes it necessary to spray at seven-day intervals.

(b) *Field Trials.* The timing of spray applications was investigated at various centres in the Federation. Sevin was applied at 0.5 per cent. active ingredient in 10-20 gallons of spray per acre depending on plant growth, by means of a knapsack sprayer fitted with a "tailboom". A "blanket" treatment involving weekly sprays (additional sprays were applied following heavy rain) from first buds to reaping was the control treatment. At Gatooma, in addition to various regular spray schedules, the feasibility of applying sprays according to rainfall records was investigated. Sprays were applied after $\frac{1}{2}$-in. rain or at fortnightly intervals whichever was the lesser period. Eleven sprays applied in this way resulted in a significantly higher yield than twelve consecutive weekly applications. It was also clearly demonstrated that eight weekly sprays, while increasing yields, were not so effective as twelve weekly sprays, and that fortnightly sprays were less effective than weekly sprays.

A trial comparing Sevin, Thiodan and DDT confirmed that Sevin was more effective against *Diparopsis* than DDT and Thiodan, but the reverse was true for *Heliothis.* Thiodan, which also controlled aphids very effectively, gave the highest yield with *Heliothis* being the major pest. Thiodan unfortunately has a higher mammalion toxicity than either Sevin or DDT and cannot be used without adequate protective clothing.

It was shown that Tedion and Rogor will control red-spider mite, but that Rogor is to be preferred as it will control aphids as well.

(c) *Extension Trial:* A large-scale extension trial was carried out throughout the Federation, to assess the efficiency of insecticides in controlling cotton insect pests, to determine differences in response between the main cotton producing areas, and to determine the nature and influence of factors affecting the response of plant growth, yield of seed-cotton, and lint quality to the application of insecticides.

The trial consisted of a series of forty plots, each plot divided into two halves or sub-plots. One sub-plot was treated with insecticide while the other was left untreated. The plots were sited on European farms, on smaller African farms and demonstration gardens in Nyasaland, and on experiment stations.

Cotton jassid caused early damage from which the unsprayed plants (all Albar 637) never fully recovered. *Diparopsis* occurred early in the season in the Lower River district and at Gatooma and, later in March, in the Central Province of Nyasaland. *Heliothis* was the major pest in Northern Rhodesia, the Sabi, at Gatooma and to a lesser extent in the Central Province, Nyasaland. The season

was also characterized by the severe outbreak of leaf-eaters, notably *Cosmophite flava* and *Sylepta derogata,* which caused considerable damage in cotton in some areas.

A summary of yield increases due to spraying, in lb. of seed-cotton per acre, is given in the following table:

Areas	Nyasaland		Southern Rhodesia	Northern Rhodesia
	Southern Province	Central Province		
Number of plots . .	15	13	10	1
Highest increase . .	1,269	1,368	1,924	
Lowest increase . .	93	114	−235	
Mean of all plots . .	542	817	827	226

In only one of the plots (shown in the table as − 235 lb. seed-cotton per acre) did the unsprayed cotton outyield the sprayed. The largest increase, one of 1,924 lb. seed-cotton per acre was obtained at Gatooma. The over-all average of all plots was an increase of approximately 650 lb. seed-cotton per acre, due to spraying. There was also much less staining of seed-cotton in the sprayed plots. In several instances, low yield increases in treated plots could be attributed to faulty agronomic practices such as late sowing, thinning and poor weeding and cultivation.

AGRONOMY

Cotton Fertilizer/Variety Trials

Two trials were planted, (a) one following a green-manure crop (Dhal = *Cajanus cajan)* and (b) the other following maize, the soil type, a red clay, being similar for both trials.

Treatments in both trials were: Fertilizer — N (as sulphate of ammonia) 0, 60, 90, 120 lb. per acre; K_2O (as muriate of potash) 45 and 90 lb. per acre. P_2O_5 at 60 lb. per acre was applied to all plots. The varieties were Albar 637 and G52/36. The plant spacing was 3 ft. 6 in. x 9 in. x 1 plant, giving 16,590 plants per acre.

In the trial following dhal the mean yield of cotton was 1,291 lb. seed-cotton per acre. The treatment N_0K_2G (i.e. 0 lb. nitrogen, 90 lb. K_2O per acre and variety G52/36) was significant at both the 5 per cent. and 1 per cent. levels. No other treatments were significant.

However, as will be seen from the table, there was a tendency for the high levels of nitrogen to decrease the yields of the Albar 637. A similar trend, but to a very much lesser extent, was evident with the G52/36. Also the highest level of muriate of potash (90 lb. K_2O per acre) decreased the yield of Albar 637 and increased that of the G52/36.

Cotton yields, as lb. seed-cotton per acre, following Dhal

Fertilizer Applications	G52/36	Albar 637
0 lb. N/per acre	1,252 lb.	1,472 lb.
120 lb. N/per acre	1,246 lb.	1,171 lb.
	6 lb. decrease	301 lb. decrease
45 lb. K_2O/per acre	1,091 lb.	1,405 lb.
90 lb. K_2O/per acre	1,397 lb.	1,273 lb.
	306 lb. increase	132 lb. decrease

In the trial following maize the mean yield of cotton was 1,963 lb. seed-cotton per acre. The treatment N_0K_1G (0 lb. nitrogen per acre 45 lb. K_2O per acre and variety G52/36) was significant at the 5 per cent. level. No other treatments were significant.

As in the trial following dhal there was a trend (see table) for the increased levels of nitrogen to result in decreases in the yield of the Albar 637, but there was an increase in yield with the G52/36. Again, the highest level of muriate of potash tended to decrease the yield of Albar 637, and to increase that of the G52/36.

Cotton Yields, as lb. seed-cotton per acre, following Maize

Fertilizer Applications	G52/36	Albar 637
0 lb. N/per acre	1,748 lb.	2,158 lb.
120 lb. N/per acre	1,898 lb.	1,962 lb.
	150 lb. increase	196 lb. decrease
45 lb. K_2O/per acre	1,843 lb.	2,160 lb.
90 lb. K_2O/per acre	1,872 lb.	1,987 lb.
	29 lb. increase	173 lb. decrease

The trial in which cotton followed maize yielded 627 lb. seed-cotton per acre more than that in which cotton followed dhal. Plant stands were identical in both trials. Also mean boll weights, 4.1 grms. for Albar 637 and 3.2 grms. for G52/36, were the same in both trials.

The cotton following dhal definitely produced fewer bolls than the cotton following maize. From observations and results it appears that nitrogen encouraged vegetative growth at the expense of fruiting. In fact it seems that Albar 637 requires only moderate quantities of both nitrogen and potash in the soil in which the trials were grown.

Cotton Defoliation Trial

The three defoliants, Pecepan, UC 15303, and Folex were tested for their effect on leaf shedding and the rate at which the crop could be picked following treatment.

UC 15303 was the most effective of the three preparations. Folex also appeared to be a good defoliant but it has a very obnoxious smell and is toxic to humans. Pecepan caused marked desiccation of the leaves on the plant but was ineffective as a defoliant. There were no differences in the rate of picking the crop from defoliated and undefoliated plants.

Crop Production Trial

This trial which occupies between four and five acres is arranged for the Chemistry Branch, Salisbury. The objectives are to assess the productivity of six different rotations and their effects on both the physical and chemical properties of the soil. This is only the second season of the trial.

Treatments

Crop Rotations. (1) Maize continuous for three years; (2) maize, cotton, maize, in three phases; (3) legume green crop, maize, maize, in three phases; (4) legume hay, maize, maize, in three phases; (5) cotton, maize, legume green crop, in three phases; (6) grass three years, maize three years.

Crop Residues. Plots are split transversely for the removal of crop residues from the one half, and the ploughing-in of the crop residues in the other.

Fertilizer. The fourteen-row plots are also split longitudinally so that seven rows received 100 lb. nitrogen per acre and the remaining seven rows received 50 lb. nitrogen per acre; 50 lb. P_2O_5 per acre and 30 lb. K_2O were applied as basic dressings. The trial is not statistically designed, and the following preliminary deductions are derived from an inspection of yield results.

The mean yield of maize was 28 bags grain per acre and of cotton 2,875 lb. seed-cotton per acre.

The mean yield of cotton following maize was 3,029 lb. seed-cotton per acre in contrast with 2,721 lb. seed-cotton per acre produced after dhal. The plant spacing was 3 ft. x 9 in. x 1 plant, giving 19,360 plants per acre.

Cotton receiving 100 lb. Nitrogen per acre yielded slightly less seed-cotton than cotton receiving 50 lb. Nitrogen per acre.

The treatments: maize continuous, maize following cotton, and maize following dhal, all produced mean yields of 27 bags maize grain per acre.

Sulphur Trial (second year)

This trial is being conducted for the Chemistry Branch and its objective is to determine the effect of sulphur as opposed to no sulphur in fertilizer applications, by measuring yields throughout the crop rotation, which is: legume, cotton, maize.

Treatments: Three levels of gypsum—0, 100, 200 lb. per acre. In addition an over-all application of 225 lb. per acre double superphosphate, 50 lb. per acre muriate of potash and 200 lb. per acre C.A.N. is given in the trial. The plant spacing was 3 ft. x 9 in. x 1 plant, giving 19,360 plants per acre.

There were no significant differences between treatments. The over-all mean yield was 3,200 lb. seed-cotton per acre.

Cob-rot Trials

Two such trials in their second year were arranged for the Botany and Plant Pathology Branch.

Treatments in Maize Cob-rot Trial I: N_0 = No Nitrogen; N_1 = 50 lb., and N_2 = 100 lb. nitrogen per acre as urea. "Clean" = Residues removed. "Trash" = Residues ploughed back into the soil. Basic over-all applications were 60 lb. P_2O_5 per acre and 40 lb. K_2O per acre. Results in pounds of grain are shown in the following interaction table:

Nitrogen	Clean	Trash	Totals
0 lb. N/per acre N_0 .	1,351·5	1,428·5	2,780·0
50 lb. N/per acre N_1 .	1,784·0	1,794·0	3,578·0
100 lb. N/per acre N_2 .	1,728·5	1,932·0	3,660·5
Total . . .	4,864·0	5,154·5	10,018·5

C.V. + 12·6% L.S.D's—Residues	1%	654·7	5%	480·1
Nitrogen	1%	534·6	5%	392·0
Individual treatment combinations	1%	378·0	5%	277·2

The "Trash" treatment was superior in yield to the "Clean" treatment, but the difference was not significant.

N_1 treatment produced a significantly higher yield than the N_0 treatment at both the 1 per cent. and 5 per cent. levels, but N_2 treatment did not produce a significantly higher yield than N_1.

The highest yield of 32 bags grain per acre was obtained from treatment N_2T (100 lb. nitrogen per acre with trash ploughed back) while the lowest yield of 22 bags grain per acre was produced by treatment N_0C (0 lb. N with residues removed). The following observations were made by the Plant Pathologists in Salisbury:

There were indications that the ploughing-in of trash increased the incidence of Diplodia where nitrogen was inadequate.

An adequate dressing of nitrogen resulted in a reduced incidence of Diplodia.

An ear-rotting fungus *Physalospora zeae* with symptoms very similar to *Diplodia zeae* was discovered in this trial for the first time in Southern Rhodesia.

There was an increase of stalk-borer attack where nitrogen was applied, and an increase in *Fusarium moniliforme* which tends to follow a stalk-borer attack.

Treatments in Cob-rot Trial II: (i) Maize, maize; (ii) maize, green crop (dhal); (iii) green crop, maize. Fertilizer applications were, in lb. per acre: P_2O_5, 60; K_2O, 40; N, 40.

As the trial consists of phased rotations, data over a number of seasons is required before a detailed analysis can be made. However, both maize following dhal and maize continuous yielded about 26 bags grain per acre.

Dhal and Soya Bean Observation Plots

The Gatooma collection of dhal was replanted for the third time in 1960–61. The collection is maintained as a source of comparatively small quantities of seed for experimental purposes which may be required by other stations and services from time to time. The demand for seed has been high.

A collection of some 250 varieties and strains of soya-beans was grown in observation plots, the seed having been obtained from several countries. Approximately 60 strains have been chosen for further examination and some of these will probably be tested in a variety trial in 1961–62. The best of 105 single plant selections will also be planted in 1961–62.

The main objectives of the work with soyas are comparisons between Salisbury bred and imported varieties for yield and quality of both seed and hay, and for

dates of maturity. It is recognized that the yield and quality of seed per acre are most important for export or for internal industrial purposes which may develop in the future; but it is also apparent that strains which produce good yields of quality hay but possibly only moderate quantities of seed will find more immediate use on the farm.

CROP TRIALS CONDUCTED AT GATOOMA FOR OTHER STATIONS

The following main results were obtained from the data provided by the stations concerned.

1. In a maize trial containing twelve varieties, conducted for Salisbury, SRH No. 52 with a yield of 39.76 bags per acre significantly outyielded all others. Seven other varieties between which there were no significant differences yielded at the rate of 35 to 30 bags per acre.

2. In a second maize trial, for Matopos, which contained thirty-six varieties, SRH No. 12 at 32.4 bags per acre was significantly greater than thirty-three others but not so when this variety was compared with NPP x K64r at 30.7 bags, or AFW x K64r at 28.5 bags per acre.

3. In a trial consisting of one hundred sorghum and millet varieties, but predominantly sorghums, for Matopos, the three highest yielders, Hybrid USK30, Hybrid 46 and Hybrid USK32, ranged from 38.5 to 34.6 bags per acre. These yields were significantly greater than all others. There were sixteen varieties, including the three mentioned, and also Feterita (11/56), Radar, and Framida, which all yielded over 20 bags per acre.

4. Seed multiplication plots of half an acre each were planted to the sorghum varieties Feterita (11/56) and to Haakdoorn (106/56) for Matopos. Haakdoorn was a failure due to extensive lodging, but Feterita yielded at the rate of 23 bags of grain per acre.

5. One hundred and sixty groundnut varieties were planted in observation plots for Salisbury. In terms of bags of pods per acre, the highest mean yield, 47.8 bags, was obtained from a total of 112 early-maturing varieties. This result was 10 to 12 bags greater than the yield of medium-late and late maturing varieties with the exception of Makulu Red A.S.1., a medium late variety, which produced 45.7 bags of pods per acre.

6. A Federal Lucerne Variety Trial was grown under irrigation at Eiffel Blue Farm by the kind permission of Mr. B. D. Blyth, from October 1958, to May 1960. Among a total of eight varieties, the mean yields of the top six, between which there were no significant differences, ranged from 14.76 to 11.33 tons of dry matter per acre, for a total of fourteen cuts. Hairy Peruvian, Africa, and S.A. Standard all yielded over 14 tons per acre over the period of the trial.

COTTON PRODUCTION

For the second successive year the officer-in-charge and the farm manager, Gatooma Station, gave considerable assistance in arranging the order of ginning of the 1961 crop, and in the processing and issuing of acid delinted cotton seed for planting. The actual classification and ginning of the seed-cotton was done by Messrs. Rhodesian Spinners Limited, by arrangement with the Grain Marketing Board.

The 1961 Crop

The total number of bales of lint ginned in 1961 was 2,576, an increase of about 1,000 bales on the 1960 crop. Approximately 70 per cent. of the 1961 production was grown in the Sabi-Lundi lowveld areas, some 50 per cent. being produced largely under irrigation. The remainder of the crop, about 30 per cent., was grown under dry-land conditions in the highveld.

Class 1 seed-cotton accounted for 65 per cent. of the total 1961 crop, Class 2 for 20 per cent. and Class 3 (unclassified) for 15 per cent.

Yields in 1961. A mean yield of 2,409 lb. of seed-cotton per acre was obtained from 415 acres of Albar 637 grown under irrigation, and treated with insecticide, at an estate in the Sabi Valley. The highest yield was 3,354 lb. seed-cotton per acre and the lowest 32 lb. seed-cotton per acre, in both instances from about 24 acres. A trial 5.4 acres of the variety Acala from the U.S.A. yielded 2,729 lb. seed-cotton per acre at the estate.

Again, mean yields produced by Albar 637, cultivated by African farmers, on different irrigation projects in the Sabi ranged from 1,400 to 2,500 lb. seed-cotton per acre.

In the highveld, dry-land crops of Albar 637 grown on European-owned farms and treated with insecticides, yielded between 1,200 and 2,000 lb. seed-cotton per acre.

The foregoing account of cotton yields constitutes a most encouraging record of what can be achieved by European and African growers through sound crop husbandry and effective insect pest control in both irrigated lowveld and dry-land highveld cotton crops.

GENERAL

Staff

Cotton Pests Research Scheme: Dr. C. Cottrell began the study of diapause in *Diparopsis* under a Research Fellowship tenable at the University College of Rhodesia and Nyasaland for a period of three years. The scheme as a whole has been extended for a further two years, to end in June 1965.

Advisory

A course was held in September 1961 on cotton-growing practices and insect pests control specifically for selected officers of the advisory services from the three territories. The course, which occupied one week, was designed to give officers very full information on cotton-growing practices and insect pests control so that they in turn will be able to advise growers and other officers.

Film Production

An instructional 16 mm. colour film entitled "Insect Pests of Cotton and their Control" together with other relevant visual aids were produced by G. A. Matthews, Research Entomologist.

PUBLICATIONS

J. P. Tunstall and G. A. Matthews. Cotton Insect Pests Control Recommendations for 1961–62 in the Federation of Rhodesia and Nyasaland. *Rhod. Agric. J.*, Sept.-Oct. 1961.

A. H. McKinstry. Information and Advice on the Cotton Crop in Rhodesia. *Rhod. Agric. J.*, Sept.-Oct. 1961.

GRASSLANDS RESEARCH STATION

H. D. L. CORBY, *Officer-in-Charge*

THE GRASSLANDS RESEARCH STATION, at Marandellas, serves the agriculture of some 12½ million acres of sandy country in north-eastern Southern Rhodesia, where the rainfall is usually sufficient, and sufficiently reliable, for arable farming without irrigation.

Within its means, the Station deals with all aspects of the agriculture of its region except tobacco, and with this crop it works by offering its facilities and co-operation to the Tobacco Research Board of Rhodesia and Nyasaland.

As its main task the Station is seeking means of maintaining and raising soil productivity. It is believed that the sandy soils of the region, once brought into cultivation, can best be preserved for continuing agricultural use by some system of ley farming, and much of the work of the Station derives from this belief. There is some work too with veld, vlei and irrigation.

The Station covers some 6,750 acres. It has a European staff of fifteen and an African staff of sixteen.

WEATHER

The rainy season was longer than usual, and rains were generally well distributed and gentle; for the most part, therefore, farming operations went smoothly and crops grew well. Rainfall was 8.25 in. above average at 44.73 in. The winter was mild, with forty-one frosts.

EXPERIMENTAL WORK

Eighty experiments, involving nearly 3,700 plots and over 1,000 animal-periods, were done during the year.

LEGUMES

Nineteen experiments were done with legumes during the year, and good progress was made in the laboratory established to back work in this field with studies of *Rhizobium*.

The *Rhizobium* collection now contains 455 strains derived from 89 species of legumes. As a result of work during the year, good locally-tested strains of *Rhizobium* are available for research for lucerne, soya-beans, Rueppell's Clover, and Kenya White Clover.

In a test of a method of maintaining cultures of *Rhizobium*, all fifty strains in the test have survived the first fourteen months without transfer to fresh growth-medium. This should prove of great practical importance in reducing the now heavy routine of maintaining the Station's collection of strains.

About 270 cultures of *Rhizobium* were prepared for other research stations and laboratories and for experimental plantings by farmers.

In the field, effort was concentrated on groundnuts, and eleven experiments were done. Early-planting was again shown to be of great importance. Varieties of the Valencia type were found to outyield those of the Natal Common type; they are, however, the more likely to sprout before harvest if there are late rains. On virgin land it was found necessary to add 200–300 lb. of gypsum per acre to secure adequate yields of groundnuts; this was best applied at flowering time.

In a comparison of strains of *Rhizobium* for soya-beans, yields of 1,800 lb. of clean threshed beans per acre were obtained with the best strain—one imported from Denmark.

With the backing of the *Rhizobium* laboratory a new programme of pasture-legume introduction has been started. Eighty legumes were planted for observation and, as a start, three of these, namely *Onobrychis viciaefolia, Stylosanthes guayanensis* and *Alysicarpus glumaceus*, have been selected for further trial. About 120 varieties of groundnut, forty of soya-bean, and about twenty miscellaneous legumes were grown for observation.

Peas grown under irrigation for seed were so severely attacked by the fungus *Ascochyta pisi* as to be useless—last season the good health of the crop had been a matter of comment.

Grasses

Grasses, as the basis of the Station's work with leys, receive much attention, and study of their culture and use was continued.

To provide a sound basis for local grassland management a series of experiments is in progress in which the relative severity of various defoliations is assessed by measuring subsequent recovery. This year, with Sabi Panicum, the reduction of vigour that follows frequent cutting was again found to be associated with reductions in the quantity of roots and their carbohydrate-content. With Star Grass, on the other hand, no differential effects appeared to follow a wide variety of defoliations.

For the third season running Sabi Panicum grown in 3 ft. rows out-yielded that grown in a close sward. This interesting finding is being studied further.

In a comparison of four grasses for use as winter foggage, steers gained an average of 17 lb. each when grazing Sabi Panicum during sixteen weeks from early June to late September, while comparable groups lost about 50 lb. each on Kazungula Setaria and Katambora Rhodes Grass. On the same grasses in early summer (till mid-January) gains were 109 lb., 98 lb. and 126 lb. each respectively.

In the Nursery some 150 plantings, mainly grasses, were watched during the year.

Effects of leys. Ten experiments to assess the effects of leys and ley-management on soil-productivity have been continued. The first and oldest of these, after four years under Star Grass, was test-cropped for the second successive season with maize. It was found that the greater the quantity of nitrogenous fertilizer that had gone on the grass the greater was the yield of the second test crop of maize; this residual effect, however, was small, and was smaller than it had been with the first test-crop of maize last year.

Where land was test-cropped with maize after having been under several different grasses for four years, it was found that the yield of maize differed from grass to grass, and that the residual value of the nitrogenous fertilizer applied to the grasses differed from grass to grass.

Livestock

Twenty-two experiments with livestock were done during the year, and were concerned mainly with the use of local feeds.

Response to feeding protein to grazing steers in winter was again disappointing, and evidence accumulates that, on the high-rainfall sandveld, winter gains are not to be made satisfactorily on veld or foggage grazing simply by meeting deficiencies in protein.

In experiments in which steers were fed in different ways in successive winters, it was shown that steers fed to gain weight in their first winter are better-developed in the loin, not only at the end of the following summer but also at the end of the following winter, than those not fed to gain weight in their first winter.

Maize-meal was shown to be an adequate supplement for fattening beef steers on good natural grazing for slaughter in February or March; a protein-rich meal is not required.

It was shown that soilage from an irrigated pasture of oats-and-vetch may be used to replace other sources of protein in rations for fattening steers in winter.

With moderately fertilized Star Grass grazing, maize-meal was found to be inadequate as the sole concentrate-ration for milking dairy cows—earlier work has shown it to be adequate with irrigated grass-legume pastures.

Assessment of the value of irrigated grass-legume pastures showed that oats-and-vetch soilage may be used to replace conventional concentrate-rations for dairy cows, provided small quantities of maize-meal are added.

Friesland heifers being over-wintered on standing maize stover made much the better gains when also given 20 lb. each of grass silage daily.

Sheep lambed twice a year successfully for the third year running, but only in cases where the ewes had been very well fed in winter.

Veld, Vlei and Irrigation

Seven experiments comprising studies of veld-management systems, effects of burning, effects of prolonged overgrazing, methods of killing trees and coppice, and the drainage properties of clay tiles in vlei land have been continued.

Four experiments were done with irrigated crops; they have already been mentioned under "Legumes" and "Livestock".

The Chemistry Laboratory

Some 1,670 samples were analysed during the nine months the chemistry laboratory was open. In addition to routine analyses of herbage samples for protein-content for Station purposes, these included analyses of herbage samples for carbohydrate-content for the main laboratory in Salisbury, and analyses of the protein-content of algae from the sewage-disposal unit of the Marandellas Town Management Board.

Library and Records

An index has been added to the experimental records, and binding of books in the library has been brought up to date.

EXTENSION

Twenty parties of various kinds visited the Station, and the total number of visitors for the year was about 680.

A Dairy Day attended by about 110 people was held on March 22nd as part of a country-wide "dairy-economy" campaign. One demonstration of hay-making machinery was given by the Massey-Ferguson Company.

In addition to the numerous talks and lectures given to visitors to the Station, twenty-seven more were given in the districts, twenty-seven special advisory visits to farms were made, and judges were provided on eight occasions. Eight committee meetings were attended.

Over 230 samples of seed and 110 bags of grass-roots were dispatched locally and to four foreign countries. In addition, farmers were provided with large quantities of grass roots which they dug themselves. Some 270 cultures of *Rhizobium* were distributed to other stations and laboratories.

Twenty-two papers, articles, and reports were prepared and/or published during the year.

DOMESTIC MATTERS

Their excellencies the Governor-General and Lady Dalhousie visited the Station during the morning of April 4th, and the Secretary to the Federal Ministry of Agriculture paid a formal visit on March 3rd.

Staff

Changes of staff involving three European and four African posts occurred during the year, and there were three vacancies at the end of the year. Officers were on vacation leave for 742 days, occasional leave for 73 days, and sick leave for 64 days. Twelve conferences and other public gatherings were attended by nine officers.

The Officer-in-Charge attended the opening of the Modderfontein Nitrogen Plant in November, and the officer-in-charge of the Microbiological Laboratory inspected work with *Rhizobium* in Holland after taking his leave in that country.

Farm Cropping

In the Station's arable rotation, which covered about 610 acres, there were, during the year, some 399 acres of planted grassland, 60 acres of maize for grain, 9 acres of maize for silage, 25 acres of velvet-beans for hay, 3 acres of soya-beans for hay and seed, 74 acres of compound allotments, and 20 acres of fallow. In addition there were 17 acres of irrigated crops. Yields of crops were average for the Station.

Farm Livestock

The Station's livestock included 79 dairy cattle, 493 beef cattle, and 150 sheep at the end of the year.

In the dairy herd the average output of milk for all lactations completed during the year, including those of first-calf heifers, was 9,034 lb. per 300-day lactation, with an average butterfat content of 3.61 per cent.

Some 171 weaner-steers were bought and 54 mature steers sold on Graziers' Agreements with the Cold Storage Commission.

Revenue from sales of meat and milk amounted to £5,804 for the year ending 30th June, 1961.

African School and Club

Attendance at the Station's African School increased slightly, and at the end of the year there were 132 pupils, 56 of them being boys and 76 girls. Seventy-five of the pupils are children of the Station's employees, while the remainder come from the surrounding district. The Station's thanks are due to Mrs. D. L. Barnes, and later to Canon S. M. Wood, for their supervision during the year.

The African Women's Club, started in March 1960, has continued to flourish and had seventeen members at the end of the year. The Station's thanks are due to Mrs. E. Gaitskell for supervising its activities.

Estate

Buildings, roads, and fences were maintained and developed as usual and some 6,000 pines were planted.

ACKNOWLEDGEMENTS

Very generous gifts of fertilizers were received from Messrs. Fisons (Rhodesia) Ltd., Messrs. Windmill Fertilizers (Rhodesia) Ltd., and Messrs. African Explosives and Chemical Industries (Rhodesia) Ltd.

HENDERSON RESEARCH STATION

DR. J. W. ROWLAND, *Officer-in-Charge*

GENERAL

The Henderson Research Station lies in the centre of the maize-growing area of Mashonaland and is concerned with the improvement of agriculture on the loam soils. With an average rainfall of 35 inches the region lends itself to intensive production from crops, pastures and livestock.

The rains started rather later than usual and, in consequence, the main plantings took place during the early part of December. Throughout the remainder of the growing season ideal rainfall conditions were experienced and maize crops yielded between 25 and 35 bags per acre.

Staff

The Fisheries Officer's post has remained vacant since the Fisheries Officer was promoted to Chief Fisheries Officer on the retirement of Dr. Maar in April. Otherwise the staff has been maintained at full strength virtually without change during the year.

The Henderson Research Station Agricultural Scientific Society has held regular monthly meetings and lectures throughout the year. On 1st March the Great Hall, built from funds generously contributed by members of the Society, was formally opened by the Patron, His Excellency the Governor-General, and handed over to the Minister for Agriculture. Some 200 members and guests attended the ceremony.

Farm Development

All roads have been maintained and improvements have been effected by gravelling, draining and the construction of culverts. In addition to the maintenance of all buildings, a new school and five African houses were erected and a start made on two houses, eight kitchens and an ablution block. Livestock handling and feeding have been facilitated by the installation of outside feeding pens for the nitrogen metabolism unit together with two grain silos, additional calf-pens and a bull-pen on the Pasture Section.

At the Fisheries Centre outlet sluices were installed in eight research ponds and rice paddy cum spawning ponds have been constructed for experiments on carp and Tilapia production. Improvements to the aquarium room and further fencing of research ponds against predators were carried out.

A new gum plantation has been established and the site of a new intensive small-scale farming unit prepared by stumping, levelling and draining.

Visitors and Advisory Visits

A considerable number of local and overseas visitors were shown the work in progress on the Station and all requests for advisory visits, specialist lectures and addresses have been met by the Station staff.

NOTES ON RESEARCH

The initial decade of this Station's work has been largely devoted to the reconnaissance of problems, methods and points of attack which will most immediately and effectively improve the welfare and economy of the country in general, and of the rural community in particular. This work has driven forward the limits of knowledge on a wide front and has thrown into bold relief the urgent need to evolve agricultural systems appropriate not only to the large and small entrepreneur of all races, but also to the small-scale peasant cultivator. It is clear that most vigorous efforts need to be made to lower costs of production as well as to increase production and, no less, to explore most diligently what is the minimum boost of capital necessary to launch individuals in each of these main farming groups into decent living and sustained economic growth.

This work has revealed a number of "soft spots" in the barriers to advancement of understanding of these problems, and full advantage is being taken of the opportunities for progress that they present. At the same time, however, it has also revealed barriers which can not be passed by field work and there is now an increasing need for more detailed and precise studies of an analytical nature on crops, pastures and animals.

The time has come and the need is being felt for heads of sections to make greater use of specialized and analytical techniques in the solution of the more intractable problems, and, where necessary, to enlist teams of specialists who command not only the best technological skills, but the necessary and often expensive research equipment as well.

From now on, every effort will be made to develop this two-pronged attack on agricultural improvement. In this report of progress, attention is drawn to the actual and current developments in farming knowledge resulting from our researches, and in addition, and no less earnestly, to the problems which clearly must be solved and which will only yield to critical and analytical study.

300-ACRE INTENSIVE FARM UNIT

The 300-acre Intensive Farm Unit has made further progress in the past year in that 900 tons of maize and jack-bean silage were made and 1,200 bags of maize grain were produced. Milk production rose from 36,700 gallons to 45,000 gallons and the daily average of milk produced per cow in milk increased from 1.88 to 1.95. The average number of cows milked rose from 53 to 64. It is clear that the soil conditions are improving and that production can be increased substantially. Although costs of production are being lowered steadily, and although the farm manager is making a good profit of some £2,000 per year after paying £500 rent, there is still a virtually unexplored field of endeavour in reducing costs of production. Efforts are being made to achieve this by increasing the size of the herd, increasing production per cow, by mechanizing milking, by increasing labour efficiency and improving the efficiency of use of bought concentrates.

The target which is aimed at is 75,000 gallons of milk a year, the production of all maize grain and quality silage and other bulk feeds, the sale of 500 bags of grain, a net profit of upwards of £2,000 for the entrepreneur and a labour force which, by its competence and productivity and proper equipment, can earn much better pay than the unit can possibly afford at present.

Certain ratios given below indicate achievements to date, and targets are placed alongside which, however, naive they may appear, are being aimed at as a sound basis on which to develop dairying on a wide scale. These targets are likely to be achieved by pursuance of this work together with specialist studies in the crop, pasture and nutrition fields.

RATIOS IN £ PER ACRE

	Capital Input (Landlord and Tenant)	Gross Output	Net Profit, Including Rent	Labour Costs	Fertilizer Costs	Bought Feed Costs
1959–61	50	33	8	3·3	5	5
Target	50	45	8 +*	5	5	5

* Depending on market prices

PRODUCTION ACHIEVED AND POSSIBILITIES

	Milk Produced	Grain for Sale	Home-grown Grain for Feed	Silage	No. of Labourers	Ave. Wage	Cost per gal. Milk	Cost per Bag of Grain	Cost of Bought Conc. per Gal.	Daily Ave. per Cow in Milk
	gals.	bags	bags	tons		£	d.	s.	d.	gals.
1961	48,000	600	600	900	15	75	24	24	10	2
Target	75,000	600	600	900	9	150	18	18	5	3

80-ACRE SMALL FARM UNIT

Plans have been made and initial development work is in progress to explore a system of crop and livestock farming on an 80-acre sandveld unit which will serve as a guide to potentialities, capital and labour requirements and policy on a small sandveld farm.

PASTURE SECTION

The work of this Section is being carried out by one professional officer, two technical research officers, two African agricultural assistants and twenty African labourers.

The research programme is designed to investigate pasture problems against a background of maize production in the fertile soils of the higher rainfall region of the country.

Investigations are in progress to explore the use of pasture products to provide satisfactory planes of nutrition for various classes of livestock. To achieve this, the complete pasture crop and livestock husbandry pattern is under consideration to determine to what extent vleis, veld and planted pastures, together with fodder crops, can provide the nutritional needs of beef and dairy animals.

Weaner Production Forage Sequence

The feed requirements for high calving percentages and weaning weights are under investigation. Results indicate that where veld is employed for summer grazing, bush encroachment and sward deterioration constitute an ever present threat to the stockman's livelihood. In order to ensure veld maintenance it is therefore necessary to stock relatively lightly in summer and a carrying capacity of one animal to ten acres should not be exceeded.

This strict limitation on the numbers of animals which can be kept, frequently obviates breeding on a practical scale. Further, the quality of the grazing during this period is proving to be inadequate for satisfactory animal production, as is shown by disappointing records of calving percentages and weaning weights.

Fertilized sown pastures provide better summer grazing, and experiments have shown that one acre can provide 150 cow- and calf-grazing-days in the growth period. Average weaning weights of 492 lb. were achieved and the quality of the herbage is such as to ensure regular calving of all cows in the herd.

Winter roughage requirements of the breeding-cow can be met by grazing veld which has been rested throughout summer, and by supplementing this with protein. Under this treatment, veld management is greatly simplified, in that full utilization and sward improvement can be achieved with fewer paddocks and water points than are normally required for rotational grazing. Current investigations indicate that the veld is stable at winter grazing pressures of as high as 48 cow-grazing-days per acre, and that animal performance is satisfactory even at this high level of winter stocking.

The beneficial use of vleis to facilitate early calving has been clearly demonstrated and one acre of vlei grazing provided adequate roughage for 45 grazing days during spring. It is clear, however, that the practice of early burning to remove the trash left over from the previous season's growth materially reduces the carrying capacity. Animals which receive a protein supplement can utilize this mixture of foggage and green growth satisfactorily and at the same time maintain condition.

Beef Production Forage Sequence

Raising beef weaners to slaughter weight continues to receive attention. Growing steers using veld for summer grazing encounter problems similar to those met in weaner production. Further individual body-weight increase during the grazing season is in the region of 150 lb. This limited weight increase means that even where satisfactory winter conditions are provided, a period of $2\frac{1}{2}$ years is required to bring the animal to slaughter weight. This period places a strict limit on the number of animals which can be produced annually and frequently presents problems in formulating a sound beef policy.

Investigations to overcome this have shown that weaner animals which receive a protein supplement can be wintered on veld grazing which has been rested throughout the summer. For this class of stock, veld in good condition may be expected to provide some 100 grazing days per acre.

Where summer grazing is provided by sown pastures, one acre will provide 210 grazing days and the quality is such that the animals are ready for a finishing feed period at the age of 18 months. Rhodesia's Best gradings were obtained for animals under two years of age when this production pattern was followed.

The possibilities of store feeding the 18-month-old animals during winter for finishing on pastures the following summer, are being explored.

Forage Sequence for Summer Milk Production

Studies on the seasonal production of milk continue. It is clear that although the pastures at present employed provide a satisfactory summer carrying capacity of 182 grazing days per acre, clearly defined deficiencies make themselves felt in autumn. In order to raise the herd average above the present 360 gallons per cow

over the grazing period on green grass, it is necessary to improve the quality of herbage grazed, or to feed a supplement during March, April and May.

The possibilities of doing this are being investigated by providing perennial legumes for autumn grazing and the use of alternative grasses selected under specific criteria. Preliminary results indicate that there was a marked increase in milk production from cows which were fed a protein supplement during the grazing season. Supplementary carbohydrate was, however, equally effective and the more precise definition of the need will receive further attention.

Over-wintering of the dry cows presented little difficulty and was successfully achieved by feeding late-cut pasture hay and 40 lb. jack-bean silage per head daily. Rhodes grass pastures and jack-beans used for this purpose yielded 2.88 tons hay and 7 tons edible silage per acre respectively.

An increase in the body-weights of all animals was recorded during their lactating and dry periods and the conception rate was 84 per cent.

Annual Legumes

Current trials to establish the principles of annual legume use in stock feeding are being concentrated on *Canavalia ensiformis* (jack-bean).

Results indicate that the annual legume, suitably conserved, is a satisfactory source of winter protein. Recent investigations were conducted on conservation in the form of silage. This has proved to be a convenient method of handling the crop which yielded 7 tons of edible silage per acre and contained 18 per cent. crude protein on a dry-matter basis. Cutting herbage at various times from the beginning of April until the end of March did not greatly influence the yield or protein content.

The silage was fed during winter as a protein feed to the following classes of stock and in all cases results were satisfactory:

(a) Beef weaners on veld grazing, 20 lb. per head daily.

(b) 18-month-old store cattle receiving 3 lb. maize-meal, 3 oz. urea daily with stover *ad lib,* 20 lb. per head daily.

(c) 18-month-old fattening cattle receiving 10 lb. maize-meal and 3 oz. urea daily with stover *ad lib,* 40 lb. per head daily.

(d) Dry dairy cows receiving late-cut hay *ad lib,* 40 lb. per head daily.

Perennial Legumes

Considerable information has been obtained on the establishment, growth and management of perennial legumes and these are now in use on a field scale.

The species *Desmodium discolor* and *D. intortum* are being used to investigate the principles of perennial legume use as protein-rich grazing in autumn and *Cajanus indicus* as protein browse in veld during winter.

The Future

Our understanding of pasture problems has reached the stage where guidance can be given to specialized analytical studies, which will enable the existing programme to be pursued further and more effectively. The following detailed studies are especially needed:

Although the commonly grown grasses have proved extremely efficient dry-matter producers and are capable of carrying high grazing pressures, animal production appears to be limited by rapid and wide fluctuations in the nutritive value of the herbage during the growing season. Whilst this can be ascribed to a certain extent to the dilution of the nutrients through growth, there is evidence that the nutritive quality is strongly influenced by climatic factors such as temperature. Investigation of the factors influencing these fluctuations can provide criteria for grass selections.

Measurements of pasture growth have shown that there is a marked decline in herbage production after the second year, despite relatively high applications of fertilizer. In many instances this decline progresses to a degree where the pasture succumbs to weed invasion. The available data indicate that large quantities of raw organic material with a low nitrogen content accumulate in the soil during the early years, causing a severe nitrogen shortage. A clear understanding of the role played by this organic matter could lead to improved management practices, a longer and more productive pasture life and greater efficiency in the use of fertilizer.

FIELD HUSBANDRY AND IRRIGATION SECTION

The work of this section was carried out by two professional officers, one technical assistant, two African agricultural assistants and twenty-two African labourers.

Over the past year the main emphasis has been on research into various irrigated crops. Some dry-land work is being continued on maize, cotton and groundnuts.

Once again good responses were obtained from nitrogen applications of up to 150 lb. N per acre to dry-land maize. With regard to the time of applying nitrogen, when two-thirds of the nitrogen was applied at *ploughing* (one-third at top-dressing), the maize yielded 31.5 bags per acre, whereas when two-thirds of the nitrogen was applied at *planting* (one-third at top-dressing) the yield was 25.9 bags per acre. During the poorer cropping season of 1959–60 the yields from these two treatments were 18.7 and 18.5 bags per acre respectively. The eighth year of continuous maize yielded 34.5 bags per acre while the average yield for all rotations was 34.9 bags per acre.

Work on the varieties and cultural practices of groundnuts indicated that the Tatagura and contact soils used were not suitable for this crop. The highest yields obtained were 1,400 lb. of shelled kernels per acre. This is unsatisfactory and efforts are being made to raise this yield.

Early planted cotton once again outyielded later plantings. The average yields obtained over the past three seasons were (lb. seed-cotton per acre): planted mid-October, 2,754; planted early November, 2,934; planted mid-November, 2,341; planted early December, 1,421; planted mid-December, 1,000.

Good progress was made with such crops as winter cereals, lucerne, peas, cauliflowers, onions and tomatoes under irrigation. The use of new hybrids and selections of wheat made yields of 22.2 bags per acre from F260 A1 A4 and 18.2 bags per acre from S29 A1 A5 possible. Good responses were obtained from nitrogen, phosphate and potash applications to wheat. The barley variety Atlas, California (ex. Sabi Experimental Station) produced 21.6 bags of grain per acre, while another strain, Atlas, California (imported later from California) produced 17.3 bags per acre.

Good responses were obtained from applications of up to 120 lb. P_2O_5 per acre per annum to lucerne. An annual application of 20 lb. fertilizer borate per acre appeared to be sufficient for maintaining lucerne yields. The hay yields from small plots were seldom over 6.4 tons while field-scale plantings produced up to 8.4 tons per acre per season. This difference may be due to more trampling and constant inspection of small plots than under field conditions. The aim of this work is to produce at least 10 tons of hay per acre. After comparing lucerne varieties for three seasons, there was little to choose between India, Hairy Peruvian, South African Standard, Hunters River, Africa, Caliverde and New Mexico. Lucerne cut at the 10 per cent. flowering stage produced the highest hay yields, crude protein, phosphorus and calcium yields in pounds per acre when compared with lucerne cut at the first flowering or 50 per cent. flowering stages.

An application of 10 tons of kraal compost per acre raised potato yields from 135 to 147 bags of 150 lb. per acre. Potatoes responded poorly to various levels of nitrogen, phosphate and potash. Frequent light irrigations, totalling 22 inches of water applied, produced 170 bags, while infrequent heavy irrigations, totalling 20 inches applied, produced 133 bags of potatoes per acre.

The first results of vegetable seed and fresh vegetable research are becoming available. The following is a summary of the more important results obtained.

Good linear responses were obtained from phosphate applications on peas. For example, seed yields were 1,290, 1,622 and 2,026 lb. per acre from 0, 40 and 80 lb. phosphate per acre respectively. The use of nitrogen at planting or top-dressed, and of a commercial inoculant did not increase pea yields. Row spacings of 7 and 14 in. increased yields over 21-in. spacings, while seed rates of 120, 160 and 200 did not influence yields. The highest yields were obtained when peas were planted on 20th April in 1960 and in 1961, when fortnightly plantings from 5th April to 5th June were compared. The varieties Meteor and Onward have the higher yields when compared with Stella and Feltham First.

Bean results were disappointing with poor responses to nitrogen, phosphate, potash and compost in 1960. The 1961 planting was destroyed by rust. Lettuce did not respond to differential nitrogen levels, spacings or methods of irrigation. The most successful time of planting lettuce depended on the season. Late rains

in June, 1960, caused disease damage in early plantings and early summer rains can cause loss of the late-planted lettuce seed. Onions responded reasonably well to nitrogen, phosphate and compost applications. The main problems with onions were bolting and thick necks. The mid-March sowings of Cape Flat yielded 39,660 lb. bulbs per acre but bolted more than the early April and mid-April plantings, which yielded 36,030 and 26,840 lb. per acre respectively. Although planted in early February, Texas Grano was not ready for harvesting before Cape Flat planted in mid-March or later. Some Cape Flat bulbs were kept for over nine months whereas the Texas Grano seldom kept more than two months.

The use of nitrogen, phosphate, boron and molybdenum increased the yield and quality of cauliflower curds. For example, 0, 50 and 100 lb. phosphate per acre produced 1,839, 3,332 and 3,733 lb. curds per acre respectively, and an application of 40 lb. fertilizer borate in combination with N, P and K increased yields from 2,386 to 3,550 lb. per acre. Insect control measures in 1960 and 1961 did not influence cauliflower yields, whereas the opposite was true in 1959.

Tomato yields of over 30 tons of marketable fruit per acre were obtained from the varieties Sunneva, Essex Wonder, Suttons Early Market and Money Maker. There were no significant responses to phosphate, nitrogen and times of applying nitrogen to tomatoes, but this may have been due to early and late blight attacks which occurred despite a vigorous spraying programme.

In total on this Section, approximately 1,750 plots are being recorded, analysed statistically and reported on. In many cases, for example, cauliflowers, tomatoes and lucerne, a number of harvests are made from each plot during each season.

The present plot and field work has opened up fields for fundamental research. Preliminary investigations have been made on the water requirements of potatoes, wheat, peas and onions. The equipment has been built up for detailed plant-soil-water relationship studies, but existing staff cannot devote sufficient time to this type of work without neglecting the experiments already in progress.

The vegetable work has shown that there is a need for improved selections and strains of cauliflowers, tomatoes, beans and onions. The diseases, pests and physiological problems of vegetable crops need detailed study.

A groundnut or legume specialist should be equipped to tackle some of the problems posed. The winter cereal work is getting under way and presents a field for detailed research into the factors affecting tillering and the control of aphids in barley. As the considerable irrigation potential is developing in the Highveld areas, it is becoming necessary to carry out irrigation studies to compare various forms of overhead and flood irrigation.

ANIMAL HUSBANDRY SECTION

The work is being carried out by one professional and two technical research officers, two African agricultural assistants and ten African labourers.

Nutritional investigations with various classes of ruminants continue to be the main subject of research by this Section. These studies are designed to evaluate the local nutritional complex, to devise methods of overcoming limitations with a view to increasing animal productivity and to study more fundamental aspects of ruminant metabolism. Consequently, the investigations cover a wide range from laboratory-type studies to field-scale observations under practical conditions.

Veld nutritional deficiencies affecting the fertility of beef cattle have been studied over the past five years. This work has clearly shown that the fertility of breeding stock is closely associated with body condition during the breeding season. This, in turn, is related to the annual protein economy of the animal and is determined by the severity of winter weight losses and the degree of lactational drain on protein reserves during summer. Where winter weight loss is obviated by the supplementary feeding of protein-rich concentrates, fertility rates in excess of 80 per cent. have been achieved, compared with less than 50 per cent. in unsupplemented cows. There is some evidence to suggest that the size of the grazing animal determines its tolerance to nutritional deficiencies and that small cattle are at an advantage in this respect. This latter observation will be the subject of further experimentation.

Studies on the supplementary mineral requirements of beef cattle have continued. These show a relatively small effect on fertility while no responses have been noted to such supplementation in the case of young cattle varying in age from seven months to 2½ years. Three elements have received particular attention. These are phosphorus, copper and cobalt, and the effects of their supplementation

on bone development, blood composition and liver storage have been studied in some detail.

Associated with the above research projects, attempts are being made to determine the seasonal changes in the nutritional status of cattle grazing on veld. Chromic oxide and faecal nitrogen are the indices being used for estimating herbage consumption in various types of cattle. Interesting breed differences have been noted in this regard, but some caution is necessary in interpretation at this stage as differences may exist in the nitrogen economy of these breed and age groups which alter digestibility relationships.

Protein availability clearly dominates the productivity of ruminants under local conditions and detailed investigations on this important aspect of nutrition have received some attention. Using both cattle and sheep in nitrogen balance trials, various factors affecting the efficiency with which ruminants utilize nitrogen have been studied. Biological values, conventionally computed, have been shown to vary considerably for these animals and be dependent on such factors as type and concentration of protein as well as on other nutrients in the ration.

A further aspect of protein utilization being studied is the determination of the protein requirements of Africander and Mashona cattle under controlled conditions. This work has not been in progress long enough to accurately evaluate the data collected so far.

FISHERIES SECTION

The work of this Section is being carried out by the Chief Fisheries Officer, one technical research officer, three African agricultural assistants and twenty-three African labourers.

Publicity and Education

A fisheries exhibit demonstrating various types of fishing gear suitable for use in farm dams was prepared for the Salisbury Agricultural Show. Commonly found fish and fish suitable for culture in dams were displayed in tanks. Staff were in attendance and dealt with numerous queries.

Addresses illustrated by films and slides were given to farmers associations, I.C.A. meetings and university students on various aspects of fisheries and fisheries research.

During the year a course of eight lectures and an afternoon of practical instruction were given to second-year students at Gwebi College. This covered basic principles and practical methods in fish culture, the use of gear and the technology of processing. Students were set questions on this course in their final examination.

Conferences and Papers

Two papers were read at the Professional Officers' Conference in November, 1960. The following papers are published or are in press:

Fisheries Systems and Agricultural Systems, A. Maar, Professional Officers Conference, 1960.

Mutual Impact of Fisheries and Agriculture, M. I. van der Lingen.

Extension and Development

During the year, advisory visits, demonstrations and investigations into possibilities of fish culture in dams and ponds were carried out in the following areas: Umtali, Hartley, Banket, Trelawney, Bulawayo, Plumtree, Limpopo, Shangani, Que Que, Selukwe, Marandellas, Mtoko, Karoi and Salisbury.

It is apparent that there is a great volume of advisory and extension work to be done in order to make the fullest possible use of the existing fisheries resources. Many of the visits were carried out in close liaison with the Department of Conservation and Extension, and members of this department accompanied the Fisheries Officer on all possible occasions. In this way it is hoped that the awareness and knowledge of Conservation Officers will be promoted. Officers can make a valuable contribution to progress in the utilization of fish resources in farm dams.

In a great number of areas the stumbling block appears to be lack of knowledge of techniques in using correct gear and it is hoped that this is being overcome by practical demonstration. Gear is also not always easily obtained, but with the establishment of net-making concerns in the Federation the position may improve. Seine nets, however, have still to be imported. While great possibilities

for expansion exist on all sides, it has unfortunately not proved possible with limited staff to follow up in each area as closely as is desired.

Numerous requests for advice from angling societies have been dealt with, and many angling waters have been inspected. Assistance has been given in the planning of programmes of stocking, feeding and control. Advice and assistance have been given in the establishment of hatcheries for angling societies in several areas. On the other hand, much information of value is received from anglers and angling societies. It would not be out of place to record our appreciation of help received from angling bodies and enthusiastic and "fish-minded" farmers in the carrying out of investigations and surveys.

Surveys

During the year surveys were made in larger waters to investigate populations and productivity in the following areas: Kyle Dam, Fern Valley Dam, Pembi Dam (Umvukwes) and Selukwe Dam. A preliminary survey was made on the Umfuli River in the Hartley area.

Regular surveys to investigate various aspects of fisheries biology are being carried out in the Mazoe Dam and in the coming year, at the request of the Department of National Parks, regular observations are to be carried out on Lake McIlwaine.

Liaison with Other Bodies

Close contact is maintained, where possible, with other bodies concerned in any way with Fisheries, such as the Native Agriculture Department, the Bilharzia Research Laboratory and various other Government bodies.

Bass Production and Stocking

The bass spawning in 1960 was irregular and late and results were therefore disappointing. Bass spawned as late as February in some areas. Nevertheless, sufficient numbers were produced at the Centre to assist in stocking programmes in various waters throughout the country.

Carp Production

Spawning results in 1960 were sufficient to allow a number of trials to be carried out with carp. Studies are being made on suitable stocking rates for maximum production of fish over 2 lb. and of the time required for fish to reach this weight in ponds under optimum conditions for utilization of foodstuffs. The maximum growth of these fish recorded has been in the Savory Dam, where sampling by net and line has taken fish of over 8 lb. after 10 months' growth. In fry rearing ponds, where fish were present in very small numbers due to predators, growths of up to 1 lb. from small fry were recorded in 3 months.

Tilapia Rearing

Studies on the monosex culture of Tilapia on a production scale have been started and are currently proceeding.

Production studies on mixed populations of Tilapia, to produce the maximum number of table fish at a reasonable production level under the following management, are proceeding and results will be evaluated after an additional season in terms of:

(1) Fertilization by cheapest means.

(2) Minimum of feeding of supplementary material.

(3) Repeated cropping.

Trout Culture

Several trout cultures are established in the Eastern Districts. Trout fry have been raised to table size at this centre in a previous trial, but no adults for spawning survived through two summers. Further trials with modifications have been started and, so far, are proceeding satisfactorily.

Serranochromis Robustus

Small numbers of this species have been obtained and are being held for studies of adaptability as predators in unbalanced dams and for sporting purposes.

Technology

Tentative investigations have been made on the preserving and packaging of hot and cold smoked barbel, carp and Tilapia. The results are encouraging and further work on this is planned. Trials have been made in the preparation of a

low-grade fish-meal from bones, heads and waste after salting, sun-drying and light fire-drying. Results are encouraging and it is possible that an outlet for waste from fish produced in farm dams may be found on the farm by feeding suitable quantities to livestock.

Pig Rearing and Fish Culture

Very encouraging results are being obtained by several farmers using the method developed at the Station. Studies are continuing in order to discover any possible side effects and remedies from constant manuring of ponds with pig manure.

During the year some 35 pigs were sold to a value of £330.

Fry

Over 1,000 lb. of fingerlings and fry were distributed during the year. In addition, a considerable number of experimental stockings were carried out.

Savory Dam

During the year, 2,482 anglers visited the Savory Dam, taking over 2,850 lb. of Tilapia and 200 lb. of Clarias. Fishing operations, which varied in intensity, accounted for 4,200 lb. of Tilapia and 240 lb. of Clarias. In connexion with the experimental investigations on the mirror carp, small numbers of these fish were introduced into the dam. Slightly more than 25 per cent. of these have been taken by anglers on rod and line. The largest, over 8 lb. in weight, was taken in August and was only 10 months old.

Bass introduced in 1960 have not been caught in any numbers and there has been no evidence of spawning.

A few shade trees have been planted around the dam and other improvements have been made during the year.

The water position, which gave promise of being better than last year, has again deteriorated and it is obvious that if this continues, it will be impossible to keep two sections of research ponds going throughout the year. Great difficulty is being experienced in maintaining an adequate level in the production ponds alone.

CONSERVATION RESEARCH

The large programme of research on erosion, soil conservation and rainfall patterns is described in the Report of the Director of Conservation and Extension.

THE MATOPOS RESEARCH STATION
(Including Nyamandhlovu and Tuli Stations)

J. M. RATTRAY, *Officer-in-Charge*

INTRODUCTION

Staff. Six vacancies occurred during the year but only two have so far been filled. Professional and technical staff appear to be very difficult to obtain.

Housing. Among the houses decorated this year were the bachelors quarters and Hull House Flat which have been so sorely in need of attention for a very long time.

Native Beerhall and School. These continue to run satisfactorily but the number of children at the school has now increased to over 120 and it has become necessary to stop the intake as present facilities are strained to the limit.

African Compound. No further additions have been made.

Crops. The season was a good one with a total rainfall of about 32 in. 600 tons of maize silage were made and 590 bags of maize were reaped. Over 9,000 bales (or 157 tons) of bean hay were harvested.

Bilharzia Campaign. In spite of an intensive spraying campaign over two years, using copper sulphate and P.C.P., the results have been disappointing. Although good kills of snails were obtained temporarily, infestations soon built up again and populations are now apparently as large as ever. It is intended to follow up with treatments using Bayer 73 when sufficient information is available on technique.

General. A large number of farmers' days, conferences and meetings were attended by various members of the staff, and many advisory visits made with officers of the Department of Conservation and Extension. Numerous visitors were conducted round the Station, including groups of farmers, Conservation and Extension officers, Young Farmers Clubs and students. Veld fires have occurred over a number of week-ends and about 2,000 acres of grazing have been destroyed. Four water-storage reservoirs, each of 100,000 gallons capacity, were constructed in co-operation with the Irrigation Department, using Rhodes Estate funds. These will help considerably to reduce wastage of water and to make water available for irrigation as and when required.

ANIMAL HUSBANDRY SECTION

Breeding

Due to a good season, ample bean hay and maize silage was produced for utilization in the large scale breeding trials, where methods of increasing the efficiency of beef production on varying planes of nutrition, and imposing different systems of selection, are being tested.

The influence of bulls, judged by differences in their progeny, may be seen in the table for weaning weights given below:

FED IN WINTER

	Grade Herd	*Registered Herd × Imported Bulls*
Average weaning weights of calves . . .	460 lb.	490 lb.

FREE RANGE

	Grade Herd	*Registered Herd × Imported Bulls*
Average weaning weights of calves . . .	360 lb.	408 lb.

These studies will be continued for a number of years to eliminate annual influences.

Physiological Studies

Using the incidence of night-blindness and the rate of growth as criteria, the effects of administering Vitamin A, with or without a protein-rich supplement during winter, have been studied.

Results obtained thus far show that the administering of Vitamin A alone gives a slight advantage over the control group but in combination with cotton-seed has no actual benefit.

AVERAGE WEIGHT GAIN OF YOUNG WEANER CALVES
(lb. per day)

Groups	Control	Cotton-seed Supplemented	Vitamin A Injected	Cotton-seed plus Vitamin A Injected
Initial weight . . .	279·0	278·7	279·0	279·0
Number of days . .	170	170	170	170
Gain per day . . .	0·36	0·68	0·45	0·68

From feeding trials with urea it appears that some advantage might be derived from using it as a protein substitute.

Sheep

By practising an intensive system of selection on sheep bred at Matopos considerable uniformity has been achieved. As a result of previous autumn versus spring lambing trials, ewes were mated to lamb-down only in spring.

A satisfactory lambing percentage of 120 per cent. provided enough progeny for the mineral feeding experiments initiated this year.

AGRONOMY SECTION

The cropping season was probably the most favourable for many years, there being no serious limitation on yields due to shortness of season or inadequacy of moisture.

Dryland Agronomy

There were significant responses to both nitrogen and phosphorus on the granite and kalahari sands, while high plant populations also increased yields of maize.

In the sorghum population trials (conducted at Matopos, Nyamandhlovu and Tjolotjo), seed rates were used for the first time instead of in-row spacing, and at all three localities the response was quadratic, indicating that 10 lb. and 55 lb. per acre were too low and too high respectively with an optimum between 25 and 40 lb. seed per acre.

In the groundnut trials, Natal Common and Valencia were the highest yielders and once again very close spacing increased yields, 1 ft. x 2 in., spacing producing twice as much as 3 ft. x 8 in. spacing. Over 100 groundnut varieties and selections were grown in observation plots and the most promising of these will go forward to next year's programme.

In spite of lodging, silage yields were good, millet at about 30 tons per acre outyielded maize by 5 tons on the granite sand, and sorghum, also at 30 tons per acre, outyielded maize by 5 tons on the heavier soil.

Difficult conditions at curing time hindered haymaking but velvet-beans and cow-peas, at different times of curing and methods of curing, were compared for yield and digestibility while sunnhemp yields and digestibility were compared at different times of harvest.

Irrigation Agronomy

Supplementary irrigation was not necessary but a potato seed size/spacing trial was planted before the rains; eelworm reduced information from this trial.

The lucerne trials (varieties and spacings) had to be terminated due to soil variability but will be started again as soon as possible.

No winter irrigation trials were conducted due to staff shortages.

Soil Moisture Studies. The programme of soil moisture studies was expanded and information collected, though not as yet examined, on a number of crops on four soils.

Plant Breeding

The Matopos top-cross, American White Flint x K64r, was supplied to three good maize growers in different ecological areas of Matabeleland and their reports were so satisfactory that the Seed Maize Association has been approached to produce this top-cross and make it available to farmers on a three-year trial basis. In spite of the long and favourable season early maturing varieties of maize and sorghums performed well in trials. 32 hybrids were included in the sorghum variety trials and gave a mean yield of 14.18 bags per acre compared with 19.68 bags per acre from the top 32 open-pollinated varieties.

Crop Ecology

Although some work was done, particularly on the growth analysis of maize and sorghums, the staff position has prevented analysis of results and this most valuable aspect of the work receives too little attention.

PASTURE RESEARCH SECTION

Development

The only development possible during the year was the lining of part of the irrigation furrow and the erection of two miles of fencing at Matopos, the removal of a hay barn to a new site, some realignment of roads at Nyamandhlovu and some bush clearing at Tuli.

Veld Management

At all three stations cattle came through the 1959–60 drought in very poor condition but are wintering exceptionally well this year. At Matopos all animals in the veld management trials were receiving supplementary protein by the end of the 1960 dry season as were most cattle at Nyamandhlovu. At Tuli, although no supplementary feeding was carried out, it was necessary to remove the cattle from the paddocks entirely in the two paddock system of management where the stocking rates were 1 : 10 and 1 : 15.

The two most important lessons learned from the drought were (1) the value of a correct stocking rate, and (2) the very strong competition existing between bush and grass. It was apparent both from the stocking rate trials and from observations carried out on neighbouring farms that cattle losses can be prevented in times of serious drought if the veld is leniently stocked but that, particularly on the highveld, a small amount of supplementary protein may have to be provided towards the end of the dry season in bad years. Only in isolated and very severe cases should cattle movement to other areas be necessary if the veld is, and has been, correctly stocked. It would appear that stocking rates of 1 : 13 at Matopos, 1 : 15 at Nyamandhlovu and 1 : 25 at Tuli are approximately correct (allowing for variations due to soil and vegetation type) and that consistent stocking at these rates will ensure satisfactory carrying of cattle in almost any year.

Although the 1960–61 season was exceptionally good from a rainfall point of view and the recovery from the drought was remarkable where past stocking rates have been lenient, it is interesting to note that past heavy stocking rates have so damaged the veld that recovery has been negligible. At Matopos, for instance, where stocking rates of 1 : 10 or greater have been imposed on thornveld, many perennial grasses have given way to annuals such as *Brachiaria eruciformis* and *Aristida scabrivalvis* and the good rainy season has done little to remedy the situation. At Tuli, too, stocking rates of less than 1 : 20 have reduced the sward to an almost pure stand of such as *Aristida adscensciouis,* an unpalatable species which provides little bulk. Although this grass grew exceptionally well during the rainy season it had largely disintegrated and disappeared by mid-August, leaving the paddocks very bare and vulnerable to erosion.

Because Tuli is situated in the driest country the effects of bush competition have been most marked there. Paddocks cleared of all but a few shade trees, even when stocked at a rate of 1 : 15 came through the drought in good condition and carried the cattle well. By October, $2\frac{3}{4}$-year-old steers which had been in the experiments for two years weighed 828 lb. and 905 lb. respectively when running in bushed veld at stocking rates of 1 : 15 and 1 : 20 respectively, and similar steers at the same stocking rates but running in cleared veld weighed 928 lb. and 1076 lb. respectively. It is interesting to note that the two latter groups (i.e. on cleared veld) had sufficient finish to warrant slaughtering at the age of $2\frac{3}{4}$ years.

At Nyamandhlovu unsupplemented cattle running on black basalt veld have lost very little weight during the current dry season and gains have been recorded when 18 month old steers were fed small amounts of groundnut meal daily. Older cattle have also gained when given access to urea blocks but they have tended to eat too much of the blocks.

Bush Control Experiments

(1) *Burning.* The burning experiments at Matopos and Nyamandhlovu continue to show that encroaching bush can be effectively controlled by a fire at the end of the dry season before the rains set in once in three or four years and that the grass remains in a healthy condition. More frequent burning, particularly earlier than this in the dry season, is destroying the perennial grasses and allowing the bush to regenerate. On the red soil at Nyamandhlovu, *Heteropogon contortus*

is apparently encouraged by frequent burning but there are signs that this in turn gives way to annuals. At Matopos, on the other hand, there does not appear to be this preliminary stage and the main perennial constituents seem to give way directly to annuals such as *Aristida scabrivalvis, Eragrostis patentipilosa* and *Brachiaria eruciformis.*

(2) *Chemical Control.* Trials carried out during the year indicate good kills of most of the important tree species treated with the butyl ester of 245T in diesel fuel when applied to the stumps of trees felled at ground level, but it is still too early to give definite results. In a trial at Tuli involving *Ammonium sulphamate* applied to *Colophospermum mopane* it is still too early to judge results, but preliminary observations indicate that the chemical has been ineffective in killing the trees.

(3) *Hand Clearing.* The thinning of bushed areas by hand is being continued on a large scale. In the area in question all trees and bushes with a stem diameter of less than six inches are being removed. Counts show that a total of 1,484 woody plants per acre (of which 1,342 are 3 ft. high or smaller) are being removed and that 23 trees per acre are being retained. The cost of operations to date is £1 4s. 4d. per acre (using labour that is not strictly supervised) but that where 245T and diesel fuel is applied to the stumps of felled trees an additional cost of 14s. 6d. per acre is involved. (Note.—Owing to financial restrictions very little mileage for supervision purposes can be allocated to the job but the work could almost certainly be executed more cheaply if better supervision could be provided.)

(4) *Control through the Use of Goats.* At Matopos and Tuli it is quite obvious that goats can be used to eliminate bush. In the Matopos thornveld one goat to three acres appears to be effective when superimposed on a cattle stocking rate of 1 : 13. Heavier stocking rates cause damage to the grass and lighter ones appear to have little effect so far on bush density.

(5) *Mechanical Clearing.* A "Fleco" Root Plough, mounted on a D7 tractor carried out a series of bush eradication trials at Nyamandhlovu. A total of ten plots, covering three soil types and five vegetation types, varying from ½ to 2½ acres in size, were ploughed. The rate of work was disappointingly slow and choking of the throat of the tool with soil and plant material further hampered progress.

Plant Succession Experiments

These experiments continue to show the extreme sensitivity of the grass on the red soils at Nyamandhlovu and at Matopos to overstocking and continuous summer grazing. On these soils the perennial grasses have been replaced by annuals and *Acacia* encroachment is being encouraged by these treatments. On sandveld at Matopos, however, similar treatment has caused *Digitaria pentzii* to become dominant at the expense of higher successional species such as *Hyparrhenia filipendual* and *Trachypogon spicatus.*

Veld Fertilizer Experiments

Experiments in which the natural grassland on three soil types receives up to 1,200 lb. per acre of nitrogenous fertilizer in the summer have continued. On all soils herbage dry-matter yields were greater from the fertilized than from the unfertilized plots. Responses to increments in fertilizer applications on black and sandveld soils were erratic. On red soil a significant response occurred when yields increased as the fertilizer application increased up to 600 lb. per acre and thereafter decreased as applications were increased up to 1,200 lb. per acre.

Feeding Trials

At Nyamandhlovu the use of a proprietary brand of urea block is being investigated and at Matopos a trial is in progress to determine how much winter grazing should be set aside for steers receiving supplementary protein in the veld. Present indications are that on the red soils at least three acres are required per mature animal if satisfactory weight gains are to be achieved.

An investigation into the value of bush silage has been carried out. At Matopos one-ton lots of *Colophospermum mopane, Combretum apiculatum, Terminalia sericea* and *Grewia* spp. silage were made. This silage was fed to sheep in digestibility trials but results of these are not yet available. It can be said, however, that the sheep refused the *Colophospermum* silage and the trial had to be stopped. At Tuli 13.9 tons of silage (mainly *Colophospermum*) were made at a *labour-only* cost of £2 7s. 10d. per ton. This has been fed to steers for the last month, but to date the animals show reluctance to take more than 7 lb. per head per day and

their weights are similar to animals running on the veld with no supplement. It is interesting to note that the reapable yield of the Tuli bush varied from 654 lb. per acre to 1,331 lb. per acre (green weight) — extremely low yields.

Dry-land Pastures

The only critical work during the year involved three dry-land lucerne trials. So many plants were eliminated during the 1960 dry season by drought and subsequently by termites that all these trials have been ploughed out.

Irrigated Pastures

A time of planting and seed-rate trial with oats is in progress. Results to date indicate that sowing oats in April and May is better than in June and that there is no advantage in sowing seed at above 120 lb. per acre. Lucerne trials continue according to plan and a new lucerne feeding trial is planned for next winter.

Water Relations

The Lysimeter and Run-Off trials continue to confirm previous results. The amount of soil and water lost from bare run-off plots is by far the greatest, but frequently clipped or burnt plots lose more than well-grassed plots.

AGRICULTURAL CHEMISTRY SECTION

Work in the new laboratory started on 6th August and was largely confined to unpacking, checking, cleaning and storing the glassware, etc., and setting up of apparatus. Part of the fume extraction unit of the Kjeldahl apparatus was omitted in error from the original consignment of goods received from overseas and there has been some delay, therefore, in getting this into working condition.

POULTRY SECTION

Development

No development was possible during the year, with the result that the experimental house, started in 1959, is still only foundation high.

Experimental

It was decided to cut down investigational work to the minimum until such time as the experimental house is completed and a research officer is appointed. However, breeding work, with the aim of improving the table-bird qualities of the New Hampshire and the crossing of various other breeds for the same purpose, continued, with promising results.

Feeding Trials. Overseas research workers are advocating restricted feeding, in various forms, during the early life of chickens (12–22 weeks) in order to delay sexual maturity, increase egg size and to improve shell texture, particularly of those birds used in the production of chicks for slaughter as table birds.

In order, therefore, to ascertain the effect of restricted feeding on egg size, mortality and production of birds, on the point of lay, and kept in confinement, an experiment was started in April using two teams (12 birds each) of New Hampshire pullets kept in laying cages. One team (A) received food *ad lib* and the other (B) received approximately 85 per cent. of the food consumed by team A. This amounted to 4 oz. per bird per day for team (B) in comparison with 4.75 oz. per bird per day for team (A). The mash used was the same for both teams. The results so far show the mortality to be the same in each team but food consumption over a period of 7 × 28-day periods was 554 lb. in the (B) team and 641 lb. in the (A) team. Egg production was 627 A, 129 B and 62 C grade eggs in the (B) team and 864 A, 37 B and 76 C grade eggs in the (A) team. Food conversion was 8.12 lb. per dozen eggs with restricted feeding and 7.15 lb. per dozen with *ad lib* feeding.

Haemorrhagic Disease. Haemorrhagic disease has caused heavy mortality amongst young birds in overseas countries but has never, until recently, been reported in this country. An outbreak of the disease was reported on a farm in the Queens Mine area which, from the post mortem symptoms, was believed to be caused by poisoning with a substance similar to Warfarin, the active ingredient used in rat poisons. An experiment to test the effect of feeding Warfarin, incorporated in the food, was therefore carried out, but proved inconclusive.

Advisory Work

During the year, 150 farms were visited, 101 visitors were received, 6 lectures and 4 demonstrations were given, and 25 meetings were attended.

Judging was done at the Bulawayo, Salisbury, Gutu and Wankie agricultural shows.

Two surveys were carried out: one in Bulawayo to ascertain the potential market, and the other to get information on the consumption of eggs and consumer preference of egg-shell and skin colour of eggs and table-birds.

The former revealed that approximately 5,000 table-birds are consumed weekly in Bulawayo. The demand for eggs is 30,000 dozen per week. The second survey was carried out with the co-operation of the Federation of Women's Institutes of Southern Rhodesia. The information received indicated that the majority of housewives (71 per cent.) prefer brown eggs and white-skinned table-birds. Eggs consumed per person are six per week. All housewives are apparently satisfied with the quality of poultry products bought. The information also revealed that retail shops are only distributing approximately 31 per cent. of the eggs and 37 per cent. of the table-birds consumed, while 35 per cent. of the eggs and 20 per cent. of the table-birds are distributed by producers and 34 per cent. of the eggs and 43 per cent. of the table-birds are consumed by producers.

The survey covered the whole of Southern Rhodesia. Replies were received from 1,472 families with an average of four persons per family.

PASTURE RESEARCH STATION — MELSETTER

F. J. B. ATKINSON, *Officer-in-Charge*

Weather

Rainfall was good, and during the year 42.56 in. fell. The 12-year average is 42.16 in. The Station had its wettest August on record, 2.04 in. being recorded.

Dairy Herd

This was maintained on pastures and conserved feed throughout the year. Apart from a small trial, no concentrates were fed. There were some disappointing heifer performances, and culling was based purely on milking records. Eleven cows were sold by auction in August. The average price was £38, which was £11 higher than last year, when they were sold by tender.

A bull was transferred from the Sabi Valley Experiment Station in January. His conception rate was poor, and he was replaced by a young bull purchased in August.

Six Friesland cows were transferred from Grasslands Research Station in June. The purpose of this is to test cows with a reputedly higher feed capacity against the existing Jerseys during the coming season.

Friesland Beef

Six bull calves were reared on separated milk, plus pasture grazing and, as yearlings, they show promise of making high-quality beef at an early age.

Sheep

Lambing took place in October; 33 lambs were born and the percentage increase was 106. Weekly weighings and grazing records gave some useful information. The average birth-weight was 9.14 lb. and at 16 weeks the lambs averaged 65.4 lb., with a top weight of 83 lb.

The "forward creep" grazing system was used for the first time, and the flock was moved forward every fourth day for internal parasite control.

Faeces samples were taken and the Veterinary Department co-operated in this aspect of the investigations.

The general good health and performance of the sheep on this Station indicate that the Eastern Districts should be well able to support a thriving mutton and wool industry.

Pastures

The policy of applying nitrogenous fertilizers to pastures has resulted in considerably increased yields. In addition to the normal silage-making, pasture hay was made for the first time. The position has now been reached where the stocking of the Station is inadequate. It is hoped to correct this by introducing beef cattle for investigation of beef on pastures, and also by the planned expansion of the sheep flock.

A simple but informative trial was carried out on Kikuyu pastures, using different levels of nitrogen in the presence and absence of phosphate, lime and potash. It was found that 500 lb. of calcium ammonium nitrate was needed on a plain Kikuyu pasture to equal the yield of grass from a clover-rich Kikuyu pasture receiving no nitrogenous fertilizer.

Yields of 24 tons of grass to the acre were achieved when 600 lb. of C.A.N. was applied to the clover-rich pasture, but in the absence of clover, this rate of application only produced 17 tons. The trial will continue and the effect of nitrogen applications on the clover population will be recorded over succeeding seasons.

Grazing days on pastures were carefully recorded, and the Kikuyu averaged 242 cow-grazing-days per acre, with a top production of 512 days. The figures for Paspalum pastures were 193 and 393 grazing days, respectively.

The Chemistry Branch made a soil survey of the Station, and all pastures were sampled for analysis in conjunction with the soil map. The results, when available, will enable difficiencies to be corrected accurately, and it is anticipated that a higher and more uniform yield from pastures will thereby be obtained.

Irrigated Pastures

H1 Rye-grass and Chilean Red Clover Pastures. These were sown in early July 1960 and carried stock from October 1960 to February 1961. The 11-acre

block gave 283 cow-grazing days per acre, five sheep being taken as equivalent to one cow. In addition, approximately one ton of silage per acre was conserved. Good utilization was achieved by using electric fences and by folding the sheep over the pasture. A small crop of hay, made in October, gave 18 per cent. protein on analysis.

The 1961 pasture was sown a month earlier to accommodate September lambing. Grazing the sheep behind netting hurdles, investigations into optimum stocking density were carried out. It was found that a pasture with 12 tons of grass to the acre would provide grazing for 778 sheep days, or would keep 50 sheep for 15 days.

Irrigated Grass Nursery

A number of strains of rye-grasses, cocksfoots, timothys and fescues were planted in observation plots. A new strain of rye-grass, called Gulf Rye-grass, which is resistant to rusts, obtained from U.S.D.A. Plant Introduction Service, gave a yield of double that of the next highest-yielding grass. *Trifolium ruepellianum* was tested and found to grow well under winter irrigation. It is felt, therefore, that this clover, together with Gulf Rye-grass, could produce a dramatic increase in winter grass production.

Horticulture

An irrigated orchard has been established and variety screening trials of peaches, apples and pears have been laid down by Mr. Jones, the Advisory Horticulturist. He has also planted a number of vegetable trials, soft-fruit plantings and a small observation trial of coffee. The old coffee plot at Martin Forest Reserve has been fenced and the trees have been pruned.

Lucerne Variety Trial

The results of this year's cuttings showed that South Africa Standard was consistently the highest yielder, giving a yield of 2.35 tons of dry matter to the acre. Hairy Peruvian and Africa were the only other varieties which yielded more than two tons.

Water Conservation

Two storage dams and three furrows were constructed during the year.

Farmers' Day and Visitors

A successful Field Day was held on the 11th of April 1961. Approximately 60 people attended and the day was opened by Mr. J. C. Graylin, the Minister of Agriculture.

A two-day veterinary course, arranged by the Veterinary Department, took place on the Station on the 15th and 16th of August; about 50 people attended.

During the year, 232 people signed the visitors' book.

Newsletter

A Station newsletter has been started during the year. Copies go to I.C.A. committees in the Eastern Region and to all farmers in the Melsetter area.

Liaison Committee

Two meetings were held during the year, on 27th October 1960 and 27th September 1961. Thanks are due to the farmer members for giving their time and much useful advice and assistance to the Station.

Future Investigations

A trial has been planned, to start with the rains, for veld improvement by the introduction of Kikuyu grass and clover into the natural veld. If this can be achieved economically, present developments in this area should be greatly assisted.

The Rhodesian Wattle Company are expanding and diversifying as rapidly as possible and are building up a large cattle population on their estates. A further aspect of this investigation is that the Forestry Commission have already inquired into the possibility of grazing their fire-guards and unplanted waste areas, estimated to amount to between 10–20 per cent. of the area. The grassing of these areas would not only increase productivity but would greatly reduce fire risk.

RHODES INYANGA ORCHARDS

C. B. PAYNE, *Officer-in-Charge*

INTRODUCTION

THE STATION comprises 450 acres of rather broken country on the south of the Inyangombe River, west of its confluence with the Nyamagwesi a minor tributary. The land rises from about 5,700 to 6,200 ft., and consists mainly of granite soils, with some doleritic influence from the numerous small dykes, and a small area of vlei. Leased from the Federal Department of National Parks, the Station constitutes part of Fruitfield, one of the farms purchased by Rhodes, which formed part of the tract of country subsequently known as Rhodes Inyanga Estate.

Experimental plantings of deciduous fruits were made here in the first decade of this century and were continued (at times on a commercial scale) until the Southern Rhodesia Department of Agriculture took over the lease in 1947. Under that department (and the Federal Ministry of Agriculture from 1953), until 1959, *ad hoc* experiments of various kinds were made, new species and varieties were introduced, but no serious consideration was given to statistically valid trials.

In the last two and a half years, and especially during the year under review, a great deal of time has been spent by the Southern Rhodesia Research Advisory Committee and by the Station's Growers' Liaison Committee in planning a series of trials to commence in 1962. The peculiar requirements of deciduous fruit experimentation, coupled with the need for adequate erosion control and irrigation facilities, have raised numerous problems. These have been aggravated by the uneven terrain but have now been resolved, and work on the Station this year has largely been concerned with preparations for these trials. The need for such trials becomes more apparent each year as the acreage of fruit planted in the Inyanga area, to say nothing of other parts of the Eastern Districts, increases rapidly. Ideally, a series of sub-stations in the various I.C.A.s would be desirable to complement the work at Inyanga; to begin with, certain work is being duplicated at the Pasture Research Station, Melsetter. Work of a fundamental nature is necessary here, since none is carried out on deciduous fruit growing under similar climatic conditions anywhere else in the world.

CLIMATE

Although no long-term climatic data for the Station are available, a small agro-met station is operated here by the Federal Meteorological Service, to which we are indebted for the table given below. In December 1960, most of the meteorological instruments were moved to a fairly exposed site on the new experimental area; the figures given here are from the old site, where principal observations are being continued for a limited period for correlation. The old site is over-sheltered, but comparisons of data from the two sites have so far shown no wide difference. Readings are now taken at four rain gauges, including one at the "potato land", some two miles to the south-east of the offices, at a height of approximately 6,350 ft. It should be noted that the ground minima given are recorded in an exposed position some distance from either screen and cannot, therefore, be directly related to screen minima.

Month	Hours Bright Sun		Rainfall (inches)				
	Average 1955–56 to 1959–60	1960–61	Average July 1951 to June 1961	1960–61		Heaviest Fall	No. of Rainy Days
				Pack. Shed	Obs. House		
October	267·7	306·6	1·97	3·23	3·16	1·42	4
November	212·4	193·6	5·34	4·01	4·02	0·84	14
December	157·8	154·1	9·65	14·27	13·48	3·20	25
January	184·4	128·0	12·73	9·94	9·13	1·83	23
February	158·0	161·8	10·14	12·18	12·20	1·53	21
March	226·3	205·8	4·21	4·60	4·28	1·05	21
April	247·2	222·5	2·57	4·10	3·39	1·70	12
May	250·7	264·2	0·90	2·52	2·28	0·86	8
June	235·9	238·4	0·67	1·14	1·15	0·37	8
July	250·1	225·1	0·62	0·36	0·37	0·14	5
August	289·9	210·9	0·79	1·52	1·61	0·75	10
September	256·5	279·3	0·69	0·41	0·67	0·23	3
TOTAL	2,736·9	2,590·3	50·28	58·28	55·74		154

1960–61	Screen Temperatures °F.						Ground Minima	
	Abs. Max.	Abs. Min.	Range	(a) Av. Max.	(b) Av. Min.	$\frac{a+b}{2}$	No. of Frosts	Lowest °F.
October .	80·3	40·3	40·0	73·2	51·0	62·1	2	31·0
November .	76·2	48·0	28·2	71·7	52·8	62·3		
December .	78·0	46·5	31·5	71·8	55·3	63·6		
January .	74·5	51·1	23·4	69·2	55·4	61·3		
February .	74·4	48·4	24·0	69·5	55·2	62·4		
March . .	75·5	51·3	24·2	70·8	55·4	63·1		
April . .	73·5	39·5	34·0	69·7	52·6	61·2	3	27·7
May . .	73·8	40·1	33·7	67·7	46·4	57·1	6	25·5
June . .	66·6	35·7	30·9	61·1	42·9	52·0	12	25·6
July . . .	65·4	34·6	30·8	58·5	43·7	51·1	6	24·0
August . .	73·6	37·9	35·7	59·2	43·0	51·1	10	23·9
September .	77·6	35·2	42·4	69·4	46·3	57·9	9	24·0
TOTAL .							48	

This was the heaviest rainy season since 1952–53 (when 67.48 in. fell at the packing shed) and in striking contrast to that of the previous season, when the total was only 30.11 in. The only month with really abnormally heavy rain, however, was December, with 14.27 in. The number of rainy days was well over the average of 124 and, consequently, the hours of sunshine were rather low.

Judged by the Californian criterion of the number of hours at or below 45°F., the 1961 winter was a very mild one, with only 594 such hours in the period June to September, at the old screen. At the new site, where cold air has no chance to build up during the night, only 477 hours were registered. Had not spraying with D.N.O.C. now become standard practice, delayed foliation would have been very considerable. Most years the figure has been well over 800 hours for the season, and in 1953 was up to 1,326 hours.

Average wind speeds during July–September were not quite as high as usual; but there were very windy days, the daily run of wind exceeding 300 miles on nine occasions during this period, and a further five times in the remainder of the year.

FRUIT CROPS

Generally speaking, the crop weights of all fruits grown on the Station were rather low this season. This, combined with the removal of about 300 apple trees, in which there was no further interest, reduced the revenue considerably. Net returns were £929.

Apples were only fair, with Rhode Island Greening, normally one of the heaviest croppers, very poor. There was a great deal of cracking in this variety and in Ohinemuri, and a very high proportion had to be sold as culls. Versfeld gave only a fair crop, and Delicious a reasonably good one of over 170 bushels. Winesap, which had been considered a slightly biennial bearer, seems to be cropping more regularly now and yielded over four bushels per tree.

Of the pears, only Beurré Bosc cropped well, Beurré Hardy and Forelle were very poor, while Bon Chrétien had a fair crop of rather small fruit. A sport of the latter, Max Red Bartlett, introduced in 1957, gave a few fruits, as in the previous year. They were uncracked this year, but very soon became mealy after picking. Wild pig were responsible for the reduction of about one ton of pears, knocked off the trees, to cull status.

Nectarines, which had not been irrigated, cracked very badly, while cracking among the peaches, all of which were irrigated for the first time this season, was very slight indeed. Crops of Kakamas were fair, those of Jubilee and Peregrine poor and excellent, respectively.

Although four small falls of hail were recorded during November and December, little or no damage to fruit occurred. The fruit most liable to damage, plums and apricots, cropped so sparsely that damage to them would have been relatively unimportant. The cherry variety, Governor Wood, produced about one pound of fruit for the first time (picked late October), and most of the cherry varieties flowered profusely this September.

OTHER CROPS

Permission has been granted by the National Parks Board for ten acres of land near the Mare Dam (outside the Station lease) to be used for propagation of virus-free stocks of potatoes and soft fruits. During the year under review a

first crop of potatoes was grown for the Potato Breeder, who supervised planting and picking operations. The crop consisted of virus-free material of Up-to-Date, Walanger, Pimpernel, Loman and a number of other varieties maintained for breeding purposes, plus 40 unnamed seedlings of promise. No accurate yield records were kept of individual varieties, but the Potato Breeder was very satisfied from the point of view of seed production.

A total of about six acres is now being fenced so that the potato plantings, which are unlikely to exceed an acre each year, can be well rotated. During the years between crops the land will be sown to Weeping Love Grass to reduce the eelworm risk. In September, about 600 seedlings raised by the Potato Breeder in Salisbury were pricked out into sterilized soil in plastic pots at the Station. These plants are being grown on for a few weeks before being planted out in the open ground.

At the request of the Senior Horticultural Officer, Umtali, small-scale vegetable trials were started this year. These comprised a cauliflower spacing and strain trial, and a brussels sprout variety and sowing date trial. An observation plot of raddish for seed is also being grown.

It is now clear that, with earlier planting and heavier manuring, more useful information would have been gained from the brassica trials. However, marked differences between the Dutch and American strains of Snowdrift cauliflower have been demonstrated, and though picking is not yet finished, Long Island Improved has yielded far higher crop weights of sprouts than Cambridge Special or Irish Glacier.

A small plot of land at the new site was planted in April with "fans" of New Zealand Flax (*Phormium tenax*) imported from Zululand. Apart from watering during the first month, a base dressing of superphosphate and regular weeding, this crop has received no special attention. 16 of the original 225 plants have not survived the winter, mainly because of termite damage. The remainder are now putting out new shoots.

RECENT INTRODUCTIONS

Raspberries of the varieties Malling Enterprise, M. Exploit, M. Jewel and M. Promise, introduced in 1959, all cropped during the early part of the year. To provide material for a future trial, beds of these four varieties, plus Lloyd George (which has not yet cropped) have been established between sheets of asbestos set 3 ft. deep in the ground. Some such means of keeping the varieties separate is essential because of their prodigious sucker production.

Elite virus-free loganberries were imported from England in April; but while under quarantine in Salisbury, because of an eelworm infestation, they all died, presumably because of unsuitable climatic conditions.

Other Rubus berries were imported from the United States of America this year; they comprise Boysenberry, Thornless Evergreen Blackberry, Marion Blackberry, Olallie Blackberry and Thornless Loganberry. These are also under quarantine in Salisbury for a virus check-up, and are growing well.

Also from the United States of America came three Highbush Blueberry varieties, Berkely, Dixi and Weymouth. All but one plant of the last-named variety died, the remainder survived the Inyanga winter well, despite being half in leaf on arrival.

A few cuttings of virus-free blackcurrants of the varieties Amos Black, Boskoop Giant, Cotswold Cross, Seabrook's and Westwick Choice were given to the Station by Claremont Estates, Inyanga. Though treated with a root-inducing hormone, only one-third of the cuttings have rooted.

The strawberry collection has been increased from the original two varieties, Vumba and Everbearing, to eight. Festival and Klaradyn, originally introduced from the Western Province Fruit Research Station by the Horticulturist, Melsetter, have been planted in the nursery. Four British varieties, all elite virus-free stock, were imported from the United Kingdom and planted at the Mare Dam site, where the risk of virus infection is slight. 50 each of the varieties, Cambridge Rearguard, Cambridge Vigour, Redgauntlet and Talisman, were imported, of which over 60 per cent. have survived. Cambridge Vigour has shown the poorest survival rate.

A mixed collection of peach budwood, originally from South Africa and California, maintained by Messrs. Mountain and Thomson (grower members of the Station Liaison Committee) for the previous two years, has been worked on to

seedling peach stocks. Trees of four further peach varieties, Kakamas types with different ripening periods, were imported from the W.P.F.R.S. in August.

Beverly Hills, an American apple imported from South Africa in 1959, has now flowered for the first time and has set fruit. It is related to McIntosh but, unlike that variety, has so far shown no sign of attack by apple mildew.

A generous gift of apple scions, comprising 163 varieties, of which only 26 are duplicated in our old collection, has been received from the Blackwood Experimental Orchard of the South Australia Department of Agriculture. This material has been top-worked on trees of Versfeld and Ohinemuri in one of the old orchards. When sufficient strong grafting wood is available from these varieties, it will be worked on to Merton 793 stocks for inclusion in the new "screening trial".

PESTS AND DISEASES

By far the most serious pest on the Station this year has been the hitherto unknown Woolly Aphis. This insect has been very much on the increase in the Inyanga area in recent years; now it has appeared here, the Entomologist, Umtali, has more scope for experiment on its control than he had on private farms. Preliminary results with Metasystox are encouraging. Towards the end of the year he also introduced the parasitic wasp, *Aphelinus mali*, from the Western Province of the Cape. It is too early to say whether the parasite will succeed here.

Fruit fly reared by the Entomologist from larvae found in a late-fruiting raspberry have been identified as *Pterandrus rubivorus*. Larvae of other flies have been found in peaches, but none has so far been identified.

Relatively little damage by fruit-piercing moths occurred this season, and no poison bait traps were put out. Young apple trees were, as usual, attacked by lagriid beetles, weevils and aphids, but the attacks were at no times serious enough to consider large-scale spraying.

Apple mildew was fairly serious on young Winter Banana trees, but nearby Golden Delicious suffered relatively little and Rome Beauty not at all. Irish Peach apples, ripening in early January, were seriously damaged by bitter rot, but this disease was comparatively uncommon later in the season. Although no routine spray was given, sooty blotch was not as serious as in previous seasons of lower rainfall.

Experiments on the control of peach rust were carried out by the Senior Plant Pathologist, Umtali, on individual branches of mature Kakamas trees. Very striking control was achieved with Maneb and Zineb. An interesting outcome of the trial was that wherever parts of a tree had been sprayed with any of the fungicides, the whole tree came into leaf and profuse blossom, naturally, at the normal season. Completely unsprayed trees at the Station and throughout the district enjoyed their most noticeably precocious blossom period for many years, sporadic flowering taking place from May onwards.

COLD STORAGE

Apples of the varieties Delicious, Granny Smith, Versfeld, Winesap and White Winter Pearmain were cold stored in a commercial plant at Umtali. The Senior Horticultural Officer, Umtali, and other officers of the department inspected the fruit at fortnightly intervals for storage disorders and rots. Despite an ammonia leak which produced scald on some of the earlier apples (Delicious), the storage was generally effective for three to five months. Winesap and White Winter Pearmain in good condition were eaten at the Liaison Committee meeting on 18th August.

PREPARATION FOR TRIALS

Introductions of new species and varieties to be included in future trials have been described above. Most of the apple trees for the 1962 plantings have been ordered from South Africa; but Rhode Island Greening trees have been propagated here on Merton 793 stocks imported for the purpose this season, our own stool-beds having produced insufficient stocks. In addition, about 50 varieties of apple have been grafted on Merton 793 for the first screening trial plantings. Kakamas peach seeds, sown in early August, have not germinated, neither have their chipped-out kernels, sown a little later. These were intended to provide seedling stock for budding in December–January to Culemborg and Kakamas for a peach nutrition trial. Unless trees can be obtained elsewhere, this trial will have to be postponed until 1963.

Officers of the Chemistry Branch surveyed the new area and provided us in November with a detailed soil map which will be of considerable value. A small area of shallow soil with gravel at about 18 in. depth has been set aside for soft-fruit work, and a piece of rather waterlogged land in a depression will have to be left out of the scheme. Otherwise all the land, apart from two collapsed slave pits, can be used for trials. It has been ploughed, disced and cultivated in an attempt to eradicate some of the shrubby perennials and bracken which infested the area. All old contour banks and major irregularities of surface have been smoothed out, pending the imposition of erosion control works suited to the trials.

Since irrigation is to play a major role in the proposed trials, a great deal of attention has been paid to the provision of adequate water supplies. A scheme devised by officers of the Division of Irrigation is now under construction, whereby water from the Mare Dam is being piped under gravity to the site. The scheme has been tackled from both ends. Piping to the site from the National Park Warden's house, with a branch line to the office, laboratory and house was completed early this year. During the last few months, as time has permitted, work has been carried out at the dam end. Nine-inch asbestos-cement pipe is being laid in a slightly realigned and levelled "ancient" furrow which has supplied the Station's modest requirements for many years.

To prevent further impoverishment of the soil an old cypress windbreak averaging six trees deep, which runs north-west–south-east between the new area and the old orchards, is now being felled. A motor-saw was purchased in June to expedite this task; but high winds, rendering the operation dangerous, coupled with the immense amount of timber which has to be cut up and moved, have slowed down the operation.

BUILDINGS

Towards the end of the year 1959–60, several alterations and additions were made to farm buildings. These were completed during the current year and there are now separate fertilizer and tool-sheds, an adequate tractor shelter protected form the rain, a seed-potato store with perspex rooflights, and a workshop. The latter has been completed recently and stocked with essential tools. Improvements to the Station entrance were also completed with the erection of a gateway. Inside the gateway and in front of the office and laboratory the area is being put down to lawns and flowering shrubs.

In the last two months, sanitary and other minor repairs were made to the Officer-in-Charge's house and improvements to the domestic water supply are now under way.

MISCELLANEOUS

For the last few years, the work of the Station has been under the supervision of the Senior Horticultural Officer, Umtali. His considerable help over this period is gratefully acknowledged. In April 1961 this supervision ended with the granting of a degree of autonomy to the Station, whereby the staff is immediately responsible to the Director, pending the appointment of a Chief Horticulturist,

The staff comprises two Europeans and a casual labour force which varies from about 15 to 25 according to seasonal requirements. To cope with the increased work involved in the proposed trials, technical assistants on the establishment are essential.

Growers in the district are in constant need of advice on fruit-growing problems; and while extension work as such might not be a function of this Station in years to come, it is certainly a very necessary part of the work here now. This is especially so because we now have little to show growers who come to the Station. We have no detailed recommendations based on our own experiments to disseminate, but there is a great deal of basic knowledge which can be given to the growers who, by and large, have little experience of fruit. During the year, 72 such advisory visits were made, some in the company of other officers of this department.

So few visitors to the Station sign the book provided that figures from it would be misleading. However, some 87 separate official visits were made by officers from this and other ministries during the year.

We were honoured by visits from His Excellency the Governor of Southern Rhodesia, Sir Humphrey Gibbs, and Lady Gibbs; the Minister of Agriculture, the Hon. Mr. J. C. Graylin, and Mrs. Graylin; the Secretary for Agriculture, Mr. C. A.

Murray; the Director, Agricultural Research Council, Dr. H. C. Pereira, and the Director, Federal National Parks Department, Mr. L. E. Stewart, and Mrs. Stewart.

The Officer-in-Charge was fortunate in being able to visit Grasslands Research Station, the Pasture Research Station, Melsetter, and the Experimental Station, Chipinga, and wishes to thank the respective Officers-in-Charge for the time they gave him. He was also fortunate to spend from 11th to 14th April visiting growers in the Melsetter–Cashel area, and is indebted to the Horticulturist, Melsetter, who acompanied him.

Special acknowledgement is due to the Directors and staff of the East Malling Research Station, England, and the Western Province Fruit Research Station, South Africa, for help in planning trials; and to officers of this Department, the Department of Conservation and Extension, the Division of Irrigation, the Federal Meteorological Service, and the Warden and staff of Inyanga National Park, who have assisted the work of the Station in so many ways during the year.

THE SABI VALLEY EXPERIMENT STATION

W. H. WILLIAMS, *Officer-in-Charge*

INTRODUCTION

The Sabi Valley Experiment Station was established during 1950–51 to investigate all aspects of irrigation agriculture appertaining to lowveld conditions, and as the first essential stage in the large-scale irrigation development proposed for the Sabi-Lundi Valleys.

During the early years up to and including the 1957–58 summer season, the work of the Station was confined largely to agronomic investigations. Of recent years, however, much more attention has been devoted to the study of irrigation methods, the water requirements of crops, the physical properties of valley soils and to exploratory investigations on the effects of water and crops on soil conditions; this work has provided a basis of fundamental information, albeit preliminary in nature, essential for the conduct and continuation of the research both in progress and as envisaged.

For the period under review it was necessary somewhat to reduce the scope of the experimental programme due to shortage of staff and to major staff changes. Professional as well as other members of staff, new to Sabi conditions, have required time to "settle in" and to become familiar with the special problems and techniques of irrigation, agriculture and research. In spite of difficulties caused mainly by lack of trained technical staff, a good year productive of results has in general been experienced. Some excellent crop yields were obtained; a detailed study was made of the literature dealing with evapotranspiration and its evaluation as a guide to determining soil moisture deficits and irrigation need, and the field work in this connection was extended to include correlation of results with climatological and phenological data; the Laboratory concentrated on field sampling and soil moisture calculations and correlations in connection with a comprehensive series of crop consumptive use trials, and the broad study of the physical characteristics of acacia and mopani soils was continued with emphasis on water availability for crop production; the Animal Husbandry Section was expanded and provided with much improved facilities for conducting experimental work which is directed to determining how best to utilize the forage and ley crops and crop residues produced during the course of irrigation farming operations.

WEATHER

A season of relatively low rainfall proved favourable for irrigation studies and at no time was waterlogging as serious a problem as it has often been in the past. Of a total of 16.44 inches of rain recorded during the year (substantially lower than a seven-year average of 19.28 inches), 14.31 inches fell during October to February; this was fairly evenly distributed except for a dry spell of 21 days in December, during which time difficulty was experienced in irrigating to schedule a large planted acreage, and as a consequence, certain sections suffered considerable moisture stress. March and April were particularly dry and allowed harvesting of maize and cotton without damage or loss.

The winter season was milder than usual, temperature extremes being less severe and not so marked as in previous years. The mean monthly temperature for May, however, was some five degrees higher than the 1954–60 May means. Somewhat more rain than normal, in light showers, was experienced; no frost was recorded.

FIELD CROPS RESEARCH

It had been evident for some time that careful long-term land-use planning of the experimental areas is essential if results of value are to be obtained from superimposed critical trials, and a start was made during the year under review to establish large-scale five-year rotations of crops on both acacia and mopani experimental farms. The rotational system employed provides areas in lucerne for 2½ years to be followed by cotton, beans, maize, wheat and a short season silage crop before returning to lucerne, and the objectives are to ensure continuous cropping of the areas concerned, to promote uniform soil conditions for experimental purposes and to reduce the weed problem. All field experiments were superimposed on these rotations.

Apart from providing uniformly cropped areas of known history for experimental purposes, abundant feed required by the Animal Section will be produced within the systems, thereby obviating the necessity to crop separate areas for this purpose.

Some results of field experiments and observations thereon are as follows:

Cotton

All trials were planted during the last week of October, and despite the usual soil crusting problems, satisfactory stands were established.

Complete control of red bollworm was afforded by spraying with Sevin at weekly intervals. Incidence of American bollworm however was high during the peak flowering period, necessitating the use of DDT along with the Sevin at that time. An attack of red spider in early January was kept in check by spraying with Rogor 40. Other pests were observed but were not serious, and no diseases were prevalent. Two pink bollworm larvae were recorded late in the season; all seed-cotton leaving the valley was fumigated with methyl bromide.

Results from spraying trials stressed the necessity for regular insecticide application to obtain complete control of all pests.

In a fertilizer and spacing trial studying levels of nitrogen from 0 to 200 lb. per acre, a classical quadratic response curve was obtained and yields of 2,700 to 3,500 lb. per acre seed-cotton were recorded; of the between row spacings tested, 3 ft. rows were found to be somewhat superior in yield to 4 ft. and 5 ft. rows, but more difficult to manage from the point of view of spraying and picking operations.

A variety trial (district) was conducted for the Gatooma Station; all but one of the varieties tested gave higher yields than the standard variety Albar 637. Also, a wide range of varieties was grown for observation and seed bulking; yields from single rows varied from 2,300 to 5,400 lb. seed-cotton per acre.

A chemical weed control experiment indicated that DCMU gave reasonable control of weeds when used as a pre-emergence spray but that some chlorosis resulted; post-emergence treatments were unsatisfactory.

Over all trials the yields averaged 3,600 to 3,800 lb. seed-cotton per acre, 90 per cent. of which was first grade. Variety Albar 637 was used at a spacing of $3\frac{1}{2}$ ft. by 12 in., and fertilized with nitrogen at the rate of 90 lb. per acre.

Maize

Pest and disease incidence on maize was exceptionally low and little virus streak was observed, but from early tasselling onwards severe lodging was experienced in all maize crops. Lodging was associated primarily with termite damage, but to a lesser extent with waterlogging, subsoil compaction and nitrogen shortage. It is considered that critical investigation into the causes and prevention of lodging is necessary before accurate results can be expected from other lines of work.

Responses to nitrogen were linear, yields varying from 16 to 30 bags per acre at the 0 and 200 lb. per acre levels of N; no significant yield differences were observed between stands of 14,520, 19,360 and 29,040 plants per acre.

A chemical weed-control trial showed that both Simazin and Atrazine, applied as pre-emergence sprays immediately after planting and shortly before the first irrigation, gave excellent control of weeds throughout the life of the crop.

Maize yields averaged 25 bags per acre; Hybrid No. 11 was generally used at a spacing of 3 ft. x 12 in. and fertilized at 90 lb. per acre N.

Wheat

No problems were encountered in establishing good stands of wheat. The standard variety used, F21B3/X2-50, was more severely attacked by stem rust than it had been in the past two seasons, but the rust came in late and probably did not affect yields adversely. The build-up of quela since the previous season, however, was marked and much damage was done by these pests.

Considerable differences were observed between varieties, depending largely on their susceptibility to stem rust; yields varied from 2 to 12 bags per acre. A marked quadratic response to nitrogen was recorded, yields varying from 5 to 12 bags per acre at the 0 and 120 lb. per acre levels of N. No differences were observed between row spacings of 7, 14 and 21 inches, and seed rates of 60, 90 and 120 lb. per acre.

Yields were generally disappointing at around 10 bags per acre. The Angola variety (F21B3/X2-50) used was planted in 14 in. rows at about 90 lb. seed per acre, and fertilized at 90 lb. per acre N.

Beans

Critical experiments on beans for seed were carried out for the first time at Sabi. Emergence of the crop was impeded by soil crusting which, together with erratic germination, prevented the establishment of satisfactory stands. Pests were not a problem and the crop remained comparatively free of rust.

Considerable differences were observed between varieties, yields varying from 776 to 2,110 lb. per acre seed, the best yield being obtained from Red Canadian Wonder. Responses to nitrogen up to 60 lb. per acre N were marked, and responses to close spacings, both in and between the rows, were significantly linear; the highest yield recorded (2,900 lb. per acre) was obtained at a spacing of 12 ft. x 3 in.

Yields averaged about one ton per acre clean, graded seed. Red Canadian Wonder was used for bulk plantings, at a spacing of 18 in. by 4½ in. (about 115 lb. seed per acre), and fertilized at the rate of 60 lb. per acre N.

Lucerne

Satisfactory stands were established in May using variety Caliverde at a seed rate of 23 to 25 lb. per acre, drilled in 14 in. rows and with a starter dressing of nitrogen.

Grass encroachment in lucerene continues to be a problem, and both yields and quality are considerably reduced during the summer months for this reason; weeds are not a problem during the winter.

One agronomic lucerne investigation was started during the season, namely a fertilizer trial involving levels of sulphur, phosphorus, boron and calcium.

Other Crops

Sorghum variety trials were conducted under both dry-land and irrigated conditions, and considerable yield differences were observed. Sorghum silage yields were high at 35 tons per acre green material cut.

Millet, grown for silage, yielded over 30 tons per acre; grain yields however were very low.

Rice, grown under irrigated non-paddy conditions, gave comparatively low yields, the most productive variety being Century Patna at 1,700 lb. per acre unhulled seed. It is apparent that rice requires to be grown under true paddy conditions for high yields.

Barley yields were only fair at 15 bags per acre, no differences being observed between seed rates of 30, 60, 90 and 120 lb. per acre; yields from a 2-row variety were somewhat better than those from a 6-row type.

Pea trials were conducted for the first time; yields were low due to disease and pest attack. In a variety trial yields varied from 300 to 900 lb. seed per acre. No differences were observed between spacings of 7 in., 14 in. and 21 in., between the rows, and 2 in., 3 in. and 4 in. in the rows. It may be that the winter climate most years is too warm for this crop.

LABORATORY AND SOIL RESEARCH

Emphasis was placed on the measurement of crop water use and consequently a large proportion of the year was spent on routine soil moisture determinations and the evaluation of the results. Compilation of data on the physical properties of acacia and mopani soil types continued.

Consumptive Use

Trials were conducted on maize, cotton, wheat and beans and one on lucerne was started. Soil sampling was carried out as often as possible between irrigations and continued until maturity of the crops. For the summer crops, soil samples could not be taken as often as desired due to rain interference, and hence the number of periods when evapotranspiration could be calculated was limited, especially during the early part of the cropping period. Total sampling depth was adjusted according to the root zone of the crop under study. Bulk density figures were determined by taking undisturbed soil cores from the walls of pits dug in each site before the trials were planted, and the figures used to convert gravimetric moistures to inches of water per 6-inch depths of soil. Pit samples were also

taken for wilting point figures calculated in the laboratory using a suction of 15 atmospheres. Field capacities were determined directly in the field using a plastic sheet to prevent surface evaporation of water.

Considerable progress has been made in this work but several seasons results will be required before firm conclusions can be drawn. Some preliminary figures and observations, however, are as follows:

For maize the mean E_T/E_O ratio over the life of the crop was 0.61, varying from 0.93 at peak consumption (70 to 80 days after planting) to 0.10 at 12 days and at 140 days after planting. It was found that the crop removed all the water it required from the top 3 ft. of soil, the mean withdrawal from the top foot being 66 per cent. of the total and from the top 2 ft., 83.5 per cent. of the total. There was slightly less than 80 per cent. of total water withdrawal from the top 2 ft. of soil over the period 45 to 100 days after planting. The crop received a total of 31.1 in. of water including just over 13 in. of rain.

Due to the rapid growth of the plants it was not possible to make basal cover determinations, but visually it was estimated that full cover was attained approximately 65 days after planting.

For cotton the mean E_T/E_O ratio over the life of the crop was also 0.61, but varying from 0.84 at peak consumption (obtained between 67 and 75 days or at 60 per cent. cover) to 0.30 at 15 days and at 130 days after planting. Maximum depth of water withdrawal was slightly over 4 ft., a depth reached approximately 80 days after planting. From about 90 days after planting, however, the depth of withdrawal slowly decreased to 2 ft. at about 120 days when the crop was starting to ripen off. Water applied, including rainfall, amounted to 28.3 in.

For beans the mean E_T/E_O ratio over the life of the crop was 0.72, varying from 0.49 at three weeks to 0.91 at peak consumption. Using the point quadrant method, a maximum of 84 per cent. cover was found to occur at 10 weeks which coincided with maximum water consumption. It was found also that 90 per cent. of total consumption occurred from the top 18 in. of soil. The total water application amounted to 27.8 in.

Figures and observations for wheat and lucerne are not yet available.

Soil Physical Studies

(a) *Air and Water Permeability.* A comparison of air/water permeability ratios on disturbed and undisturbed samples showed that results from the latter were very variable, whereas ratios for disturbed samples indicated a much greater degree of uniformity. The variability could be attributed in part to natural soil heterogeneity and insufficient replication in sampling, due to shortage of tins, and in part to the lack of adequate rigidity in the walls of the sampling tins.

All ratios obtained were fairly low, showing a good degree of soil stability; it is thought, therefore, that generally it will be unnecessary to take undisturbed samples for soil stability characterization.

Air permeability determinations conducted at different moisture contents on disturbed samples indicated that moisture contents up to 6 per cent., or approximately wilting point, had little effect on air permeability, but that an increase in moisture content from 6 to 12 per cent., however, resulted in a fourfold increase in air permeability. This was contrary to expectation and requires further study.

In general, a soil with a low degree of stability will have a low hydraulic conductivity and will take some time to pass a stable flow of water. It is considered, therefore, that an indication of instability will be obtained from a simple hydraulic conductivity measurement. The procedure adopted at present is to allow water to pass through the uniformly packed soil column until equilibrium is reached, and then to measure the amount of water passing through in ten minutes; in this way, a rough classification of soils on the basis of permeability to water can be made.

(b) *Soil Water Retention.* A number of field capacity determinations have been made on both acacia and mopani soils by direct soil sampling commencing on the second day following an irrigation and using a plastic sheet to eliminate water loss by evaporation. Downward drainage stopped two to three days after irrigation in the top 3–4 ft. but, in some cases, continued for four days in the fifth and sixth foot. The observed field capacity figures are being correlated with water retention data as determined at various tensions in the laboratory.

Results on the Experiment Station indicate that mopani and acacia Class A soils have very similar water-holding capacities, even though the former tend to be slightly heavier in texture.

(c) *Basic Infiltration Rate.* The ring method was tested in a series of experiments conducted before and after irrigation on mopani soil. In dry soil conditions results varied between 1.0 and 4.0 in. per hour, the mean being 2.4 in. per hour and the C.V. 39 per cent.; on wet soil the basic infiltration rate varied between 0.5 and 2.7 in. per hour, the mean being 1.4 in. per hour and the C.V. 53 per cent. It would appear, therefore, that the very considerable variability experienced with this method is unlikely to be reduced by irrigating before tests are made.

On acacia soil the concentric ring method gave similar variable results between 0.1 and 3.5 in. per hour, the mean being 1.5 in. per hour.

Soil Fertility Studies

Work was confined to further studies of soil organic matter content associated with different cropping sequences. The Mopani Rotation series of plots (72), together with adjacent areas under natural vegetation, were sampled and analysed. Contrary to previous reports, no conclusive evidence was found of a build-up of soil carbon under lucerne cropping but the results indicated that the heavier Class C soils have higher organic carbon contents than the lighter Class A soils.

IRRIGATION EFFICIENCY

Trials were continued on farm-scale and also on experimental-scale plots with special reference to the efficiency of distribution of water and the prevention of extremes in the amounts of water applied.

Using flat and furrow methods on 800 by 30 ft. acacia plots and a 4 cusec stream, efficient distribution of water was observed on both cotton and maize. However, for cotton, 11 applications, averaging 3.40 in. for the flat and 3.03 in. for the ridged plots per application, were required and nine irrigations for maize, averaging 4.30 and 4.20 in. for flat and ridged, respectively. Total amounts applied, therefore, were excessive in both cases. This was probably due to the fact that ridging was done eight weeks after planting; the furrows were small and amounted to corrugations, which soon became ineffective in maintaining a more rapid flow of water down the plots.

No differences also were observed in total amounts of water applied by the flat and furrow (corrugations) methods to wheat and beans which, however, required by comparison reduced applications of 30 and 22 in., respectively.

On the 500-ft. plots, mopani Class C soil, planted to cotton and maize, followed by wheat and lucerne, efficient distribution of water was more difficult; this was reflected in plant growth and only wheat showed any uniformity. No yield differences were found between 1 and 2 cusec streams in the case of cotton and maize, but generally less water was applied by the larger stream, amounting to 17.07 as compared with 22.75 in.

On the 390-ft. long-grade plots, water application in 1 and 2 cusec streams on 1 : 500 grade was excessive, producing vegetative growth to the detriment of yield. A more manageable and higher-yielding crop was produced on the steepest grade (1 : 200), where almost half as much water was applied. Results indicated that for optimum cotton yields about 30 inches of water would be required.

On short experimental plots no differences in yield or total applied water were observed on cotton and maize under flat and furrow systems, and using 1 or 2 cusec streams.

AGRO-METEOROLOGY

Studies are in progress on the influence of climate on crop production, and work is being done on the relationship between meteorological data and the water requirements of crops, the determination of evapotranspiration by empirical methods and its use as a basis for irrigation control, the analysis of evaporation as determined by meteorological instruments and the empirical methods of Penman, Thornthwaite, Walker and Blaney and Criddell.

A start has also been made on the ecological analysis of environmental factors and their influence on crop yields and on a study of the growth and development stages during which they are effective.

GENERAL

The cement lining of the main canal supplying water to the Development Farm and to the Station deteriorated rapidly over the past year and major repairs will be necessary. The Irrigation Department carried out exhaustive tests to ascertain the causes of the lining break-down, but conclusive results were not forthcoming; the Laboratory Section assisted in this work.

The Irrigation Department also assisted the Laboratory in work on the *jetting of conduit piezometers,* using aquagel as a drilling mud.

Liaison with the Southern Rhodesia Department of Native Agriculture continued during the year; visits were exchanged and meetings to discuss research programmes were attended by Station personnel, who also assisted at Land Development Officer courses of instruction in irrigation methods. The Laboratory completed analyses of soil samples and reported thereon in connection with irrigation of an area at Chibuwe using pumped water.

Station technical maintenance of a high order was carried out during the year and many improvements were completed in the engine-houses, workshops and at the pump station. Farm machinery and all buildings were maintained in good repair; house redecoration was attended to as required.

Two two-bedroom houses for Meteorological Observers were built, using materials supplied by P.W.D. and paid for by the Meteorological Department.

The staff situation remained most unsatisfactory.

Mr. Jackson, T.A. Agronomy, resigned at the end of January, and it proved impossible to engage a replacement.

Mr. Calissendorff, T.A. Laboratory, resigned and returned to Holland in March. The post was taken by Mrs. Metelerkamp, who worked full time from March to August, and then for the remainder of the period on a part-time basis.

The Agronomist (P.O.) post remained unfilled, and the Senior Agronomist was without technical asistance throughout the year.

The Officer-in-Charge read a paper (prepared in conjunction with Mr. B. D. Soane) at the Fifth Annual Conference of Professional Officers, November 1960, and attended meetings in Salisbury of Working Party No. 5 (Irrigation) in connection with studies on African Agricultural Production.

GWEBI AGRICULTURAL COLLEGE

Dr. W. L. FIELDING, *Principal*

INTRODUCTION

The College year under review commenced on 6th October, and Diploma Day was held on 19th October 1960, when the Hon. J. C. Graylin, M.P., Federal Minister of Agriculture in the Federation of Rhodesia and Nyasaland, and Mrs. Graylin, were the guests of honour. Mrs. Graylin presented the Diplomas to Course 10, and the trophies and prizes to Courses 10 and 11.

The commencement of the second decade in Gwebi's history and the rounding off of practical instruction with the provision of facilities for growing tobacco were marked by a special field day, held on 22nd February 1961. The Rt. Hon. Viscount Malvern, C.H., K.C.M.G., was the guest of honour; as Sir Godfrey Huggins, and Prime Minister of Southern Rhodesia, he had officially opened the College on 15th February 1950. In his speech, Lord Malvern referred to the successful establishment of the College and its worth to the farming community in training young men in the science and practice of agriculture. He approved, in particular, of the very practical nature of the course. Lord Acton, Chairman of the College Advisory Council, also spoke, whilst the Principal and various members of the staff addressed the visitors at various points during the organized tour of the College farm.

On page 129 of the report for the year ending 30th September 1960, an analysis of applications for October 1961, as they stood in September 1960, was given. When places were actually offered, many applications fell away, and Course 13, to be admitted in early October 1961, finally numbered 38. As reported below, 32 students of Course 12 qualified for second-year studies, giving a complement of 70 students for the 1961–62 College year. Available accommodation will thus be completely taken up, but once again all suitably qualified applicants who wished to enrol have been accepted, and the position is still not such as to warrant a recommendation that Government provide funds for a further stage of expansion.

As a result of the suggestion of the Chairman of the College Advisory Council that Gwebi should provide for girls, a new inquiry into this question was instituted on a wider basis than that carried out in 1957. The result of this inquiry made by the Federal Ministry of Education in girls' schools, and by the Natural Resources Board through I.C.A. committees, revealed very little real interest, and there is certainly no reason to recommend the provision of suitable accommodation for girls at Gwebi, at present.

A suitably qualified Indian was offered a place in the course to commence in October 1961, but the applicant withdrew.

The College Advisory Council, and the Federal Standing Committee on Agricultural Production, recommended that all students must take all parts of the curriculum and that no special accommodation or diet could be provided for any student. Absence from the College to attend religious festivals would only be permitted on three days in term time per College year. The Ministry agreed.

EDUCATION

Thirty-two students of Course 11 sat the final examinations in July 1960. All 32 students obtained the Gwebi Diploma, 15 of these being first class. This is the third time in Gwebi's history that all second-year students have obtained the Diploma, former occasions being Course 4, in 1954 (17 Diplomas) and Course 5, in 1955 (18 Diplomas). In those years the College was smaller than it is now. It is also noteworthy that Course 11 produced the largest second-year course Gwebi has known, and it is therefore particularly satisfactory that all 32 students reached Diploma standard. Student material now available to Gwebi is of a generally higher standard of secondary education than in the earlier years, and this undoubtedly contributes to a higher all-round performance, with less wastage.

Outdoor-teaching continued as usual, and an interesting feature was the number of visits made to farms where "Gwebians" (old Gwebi students) are established as managers or are farming in their own right.

The *Long Tour* took the second-year students (Course 11) northwards through Glendale, to the Umvukwes and the Centenary Block, then westwards through the Dyke and southwards again via Raffingora and Banket; the last morning was spent at a Turkish tobacco field day at Trelawney Research Station. On several occasions in the past, much longer tours have been undertaken, but because of shortage of mileage the 1960 tour had to be shorter. Careful reconnaissance is carried out by the Principal when arranging these tours, and it is satisfactory to read that, despite comparative nearness to home, satisfaction was felt by the students. One of them, writing in *Echoes* (the student magazine) says: "We began the tour with much apprehension as to the desirability of visiting an area of so similar a nature to Gwebi, but it turned out to be a really first-class series of farm visits. We did not not spend too much time in the truck and were not unduly rushed at any point".

DEVELOPMENT

Education

Last year's report (page 131) referred to the introduction of practical tobacco teaching and the expected all-round improvement in field practice which would result from this development. These expectations were more than fulfilled in the 1960–61 season. The work was handled by the Lecturer in Crop Husbandry, working in close collaboration with a Senior Field Instructor, whilst several other members of staff took a close interest. The College wishes to express appreciation of advice and assistance given by the Tobacco Research Board and the Chemistry Branch of the Department.

All students took part in the various field operations involved in growing and reaping the crop. For curing, the second-year students were organized on a roster of barn duties; small groups were able to complete the curing of particular barns allotted to them, and to take a close interest, too, in other group's barns. The limitation of a quota made instruction in grading difficult; the Tobacco Marketing Board later agreed to relieve Gwebi of any quota agreement, so that an improvement in grading instruction should now be possible.

Field Husbandry. The major developments were the growing of tobacco, the introduction of potatoes to the Broadbalk rotation, and the putting into practice of the results of a time and motion (labour saving) study. The latter has been written up for publication in the *Rhodesia Agricultural Journal.* The policy of introduction of planted pastures to the Gwebi South rotations continued.

Animal Husbandry. There were no developments of any note in the Animal Husbandry Section, including the Poultry Plant.

Engineering and Building Construction. Funds available for the purchase of building materials were again used for construction in the African employees' village; the practical building instruction of students was combined with this project.

The construction of four tobacco barns and the grading shed was completed in time to cure and grade the 1960–61 crop. The students played a considerable part in the building work. Each barn is differently equipped to give students a variety of experience in curing.

Estate. The planting of flowering trees and shrubs continued. A turf wicket and cricket nets were established.

PRODUCTION

Total rainfall was slightly above average, being 33.82 in., as compared with a 45-year mean of 32.37 in. Further weather details are given under the Research heading below but, from the general production viewpoint, it should be noted that the amount and distribution of rainfall for our major crops was very satisfactory this season. The only difficult period was when sufficient rain to enable final land preparation and planting did not fall until 21st–23rd November. Except for water-planted tobacco and potatoes and some dry-planted maize, the main rain plantings were somewhat delayed for this area, where meteorological authorities say there is an 80 per cent. probability of adequate planting rains falling before 25th November. Gwebi has now had two succeeding years in which planting rains have been late. In the season under review the initial planting rains were not followed by any large falls; however, a series of light rains was adequate to ensure good germination; stands of maize and potatoes planted at this time were very good. Thereafter, rain fell in a very consistent manner through to mid-April 1961. Probably due to a large number of cloudy days, the mean temperatures during the main growing months were 1–2° F. below average.

The following figures give the facts regarding land utilization and field production on the Gwebi College farm, season 1960–61:

Crop	*Acres*	*Production*	*Yield per Acre*
Maize grain (Broadbalk)	91·00	2,116 bags	23·30 bags
Maize grain (Gwebi South)	187·00	3,101 bags	16·60 bags
Maize silage	19·00	197 tons	10·40 tons
Sorghum silage	7·50	126 tons	16·80 tons
Munga silage	7·50	78 tons	10·40 tons
Groundnuts (unshelled)	20·50	162 bags	7·90 bags
Sugar-beans	19·00	59 bags	3·10 bags
Soya-bean seed	31·50	109 bags	3·50 bags
Soya-bean hay	32·00	32 tons	1·00 tons
Dolichos-bean silage	16·00	82 tons	5·10 tons
Dolichos-bean grazing	28·00	—	—
Potatoes	20·00	1,572 bags	78·60 bags
Tobacco	10·25	15,615 lb.	1,516·00 lb.
Cotton	0·25	245 lb.	980·00 lb.
Rhodes grass leys	142·50	—	—
Napier grass grazing	22·00	—	—
Green manures	38·50	—	—

Note: Bags grain mazie = 200 lb. net.
Bags groundnuts unshelled = 65 lb. net.
Bags sugar-beans = 200 lb. net.
Bags soya-beans = 200 lb. net.
Bags potatoes = 150 lb. net.

Silage yields are estimates based on the number of loads by weight of one load. Hay yields are rough estimates made by eye.

Sales of field produce have risen considerably, due to the remuneration from potato and tobacco crops grown this season, and to the fact that favourable weather led to the accumulation of a maize surplus which could be sold.

The following figures give the actual acreages of crops sold:

	Acres
Maize	122.00
Tobacco	10.25
Potatoes	20.00
Cotton	0.25
Vegetables	0.25
TOTAL	152.75

This represents only 21 per cent. of the College arable area, the remaining 79 per cent. being devoted to producing food for the African staff (farm hands, hostel, waiters, cooks, laundry hands, office messengers and telephone operators, estate, experimental staff, drivers, etc.), livestock (dairy and beef herds, pigs, sheep and poultry) and for soil restorative purposes.

Maize yields on Gwebi South were lowered by poor yields from Huggins and Lilford fields in particular. The maize on Huggins followed four years of Sudan grass which had seeded in the past and became a serious weed in consequence; the land is low-lying and in parts too wet. Lilford was in its fifth year of continuous maize; because of the poor seed-bed conditions which can result from the late dry ploughing necessitated by a continuous maize policy, it was the last field to be planted, at the end of November, and also, in the poorest places it had a very low pH.

Yields of all legume crops were very poor, which is the rule, not the exception, at Gwebi. One obvious requirement is to greatly increase plant populations and, in an effort to achieve this, row widths will be reduced from 3 ft. 4 in. to 2 ft. 6 in. for all the crops in the coming season, and thicker stands in the row will be allowed for.

An average price of 27.3d. per lb. was obtained for the tobacco which, with a yield of 1,516 lb./acre, gave a gross cash return of £166 per acre. It is interesting to compare this return with the present-day commercial growers' estimated per acre cost of production of £100 to £120 per acre. Valuable experience of handling the crop on this comparatively heavy soil was gained, particularly with regard to water planting, which was more difficult to achieve than anticipated. The problem of producing high-quality leaf on this soil was fully appreciated and experienced; however, improvement may be possible if more fibrous material can be ploughed in and topping and reaping adjusted to the conditions. From the

teaching and student practical point of view, Gwebi's first tobacco crop was a considerable success, which is the main thing. As anticipated, the tobacco crop filled definite seasonal gaps in the practical field work programme. The output of work and the standard of it were satisfactory once the students gained the necessary experience in the field, an aim that had already been achieved with other field operations. The Acting Senior Lecturer in Field Husbandry reports " . . . the Field Instructors deserve great credit for achieving this goal and the co-operation of the Matrons, in providing food at unusual hours, is gratefully acknowledged". These are points of College administration which would not occur to the farmer or lay observer of Gwebi, but which must be satisfactorily solved to achieve a proper programme of practical instruction with a large body of students.

Giant Rhodes grass was successfuly established on Nyasaland (3), Gwebi South; the maize crop on this field was undersown with the grass-seed at the time of the last cultivation and the technique of rolling inter-row spaces with tractor wheels, after broadcasting the seed, was found to be very satisfactory. A small paddock of Kikuyu grass was established near the dairy and pig-sties, the effluent from which will be applied to it.

Veld management methods suited to Gwebi have evolved as the years have gone by; they fit the existing paddocks of natural grassland and are used in student instruction. The systems are, briefly:

(a) The "A" Camps are five in number and total 166 acres. A four-camp, one-herd system is used, with a fifth camp for hay, which is included in the rotation.

(b) Camps 3, 4 and 5 are adjoining and extend over 635 acres. The system used involves the rotation of two herds of cattle through the three camps during the growing season. Each camp is burned in October–November, *once in four years.*

(c) Camps 8 and 9 (Acton Meadow, on Gwebi South) cover an area of vlei and semi-vlei. The system involves one herd, which is split at certain times of the year, and hence alternates between a one-herd, two paddock and two-herd, two-paddock system. Each camp is burned once in four years.

The Friesland dairy herd continues on the high level of production reported in recent years. Periodic pregnancy tests have revealed a high level of fertility at 90 per cent. of the herd in calf, indicative of sound management and absence of disease.

The following figures give overall herd averages, including first calvers:

Year	Lactations	Milk	Butterfat	Butterfat	Days
		lb.	lb.	%	
1958–59 . .	35	9,457·8	346·25	3·66	291
1959–60 . .	41	9,960·0	354·06	3·61	294
1960–61 . .	24	9,984·8	337·90	3·44	292

The Hereford herd and Friesland heifers were wintered on munga silage and sweet sorghum silage in place of maize silage, fed in conjunction with sunn-hemp hay and a mineral lick. The ensiling of munga and sorghum provided the students with valuable experience of additional crops. However, neither the nutrient value nor the palatability of these preserved crops approached that of maize silage and the cattle suffered accordingly. This is unfortunate because the sorghum yielded 16.8 tons per acre and was easily harvested with an economically priced flail-type forage harvester. By late August, with calving imminent, a change had to be made and maize was substituted for half the silage ration. A pound a day per head of stock meal was also provided and improvement set in.

Forty eight-month-old Hereford-type weaners, purchased in early July through the Cold Storage Commission graziers scheme, were successfully wintered on a daily ration of 6 lb. maize silage and $^1/_5$ pint of a proprietary urea/molasses material per steer. The animals were on winter veld grazing.

The College continues to participate in the Pig Industry Board litter-testing scheme and results indicate the sound quality of Gwebi stock.

The College poultry plant produced 18,410 dozen eggs and 1,492 table-birds, once again practically supplying the requirements of Salisbury's three central hospitals, and giving an equal revenue to that of last year.

RESEARCH

A limited research programme was again carried out.

Field Husbandry

THE WEATHER — RAINFALL AND TEMPERATURES, 1960–61 SEASON

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	Total
Rain, inches . .	—	—	0·10	0·56	2·93	10·12	7·23	6·12	4·06	1·45	0·76	0·49	33·82
45-year mean . .	0·03	0·07	0·16	0·91	3·85	6·52	7·65	6·99	4·52	1·19	0·36	0·11	32·37
Rain days . . .	—	—	1	2	14	21	20	13	16	11	2	4	104
Days, ¼ in. . . .	—	—	—	2	5	10	5	7	6	1	1	1	38
Mean max. temp. .	69·1	77·1	80·4	85·0	80·6	79·2	76·5	77·6	78·3	79·2	78·5	71·9	—
Mean min. temp. .	40·1	43·6	48·7	55·0	58·7	60·0	59·6	58·9	58·2	54·6	47·7	43·5	—
Mean temp. . . .	54·6	60·3	64·5	70·0	69·7	69·6	68·1	68·3	68·3	66·9	63·1	57·7	—

Note.—The main feature of the weather this season was the adequate and very evenly distributed rainfall. From the earliest planting rains there was not a 10-day rainless period until 17th April to 13th May (26 days). The desirable rainfall pattern has resulted in very high yields of maize in particular. The only period which was at all difficult was at the beginning, when planting rains were light and relatively late for this area. The first rain planting took place on 24th November. These plantings were followed by light showers which ensured good germination.

Temperatures during the rainy months were slightly lower than average; however, those for March to May were slightly above average resulting in a more even temperature regime during the growing and maturation period than usual.

Maize Varieties. Thirteen varieties and hybrids were compared. These all produced relatively high yields, ranging from 31.4 bags per acre for Southern Cross, up to 48.5 bags per acre for single hybrid 59H17. Of the *commercial* hybrids, No. 12 at 40.0 bags per acre yielded better than Nos. 10 and 11, as in previous experiments but, as indicated, 59H17 and two other single hybrids, 58H1 and 58H6, have outyielded No. 12.

The Effect of Residual Nitrogen, applied in 1959–60 to the First Maize Crop after a Grass Ley, in Combination with Applications to the 1960–61 Crop. Prior to planting the crop, small increases in the mineral nitrogen before incubation due to previous applications were detected. No significant response in yield, however, was obtained. A significant, though small, response to nitrogen applied direct to the crop was obtained. The results were somewhat unusual in that the yield level, with no direct nitrogen application, was far greater than anticipated, but the responses to direct nitrogen applications were much less than expected. Levels of nitrogen applied to the first crop of maize, ranging from 120–360 lb. per acre of N resulted in available nitrogen levels, prior to the second crop, of from 41 to 59 p.p.m. (mineral N + N released in incubation). The mean yield, with no direct nitrogen application to the second crop, was 28.9 bags per acre. Direct applications of 40 and 80 lb. per acre N produced yields of 30.2 and 31.3 bags per acre, respectively. In this experiment calcium ammonium nitrate was used as the source of nitrogen; it had no effect on the soil pH.

The Residual Effect on Maize of Fertilizer and Manure applied in 1959–60 to Potatoes. Neither nitrogen nor potash left any residual effect. There was, however, a big residual effect with manure (good compost), particularly where no phosphate was applied to the maize in 1960–61 or to the potatoes in 1959–60; the increase was 17.4 bags per acre of maize.

Potato Varieties. Using a covariance method of analysis suggested by Rothamstead, it was found that differences between varieties can be attributed in part to their differential resistance to the diseases present and in part to other genetic properties.

Soya-beans. Inoculation of various varieties produced no increases in yield.

Lucerne. The dry-land variety trial again produced only one cut.

Pastures. The two experiments with planted grasses are designed to determine differences in yield potential and feed content which may exist between 25 selected indigenous grasses and the effect of varying management techniques on

regrowth in subsequent seasons. Scatter diagrams of various results have been prepared, and these indicate:

Cut 1 : Cut 2 — slight positive correlation.
Phosphate % : Yield — no correlation.
Crude protein % : Phosphate % — slight positive correlation.
Crude protein % : Crude fibre % — slight negative correlation.
Crude Protein % : Yield — no correlation.

ANIMAL HUSBANDRY

Steer Feeding Trials. These have included comparisons of various exotic and indigenous breeds, over a period of years. Statistical analysis of the data from completed trials shows no significant breed differences under the system of management practised; there appears to be greater variation within than between breeds. Trial No. 4, to be slaughtered in mid-October, has included Nkone, Africander, Aberdeen-Angus and Tuli cattle. Trial No. 5, recently commenced, consists of F.1 cross-bred progeny, as opposed to pure-breds in earlier trials. These are: Angus × Africander, Boran × Africander, Santa Gertrudis × Africander and Brahmin × Africander. The object is the economic production of high-quality young beef.

Lambing in the Blackhead Persian Flock. Lambing twice a year has proved too heavy a strain on the ewes, but two lamb crops in 18 months have given 94 per cent. lambing, compared with the normally accepted 70–75 per cent. for one lamb crop annually.

AGRICULTURAL SHOWS

Once again Gwebi exhibited a considerable string of Friesland and Hereford cattle at the Umtali and Salisbury shows, winning many awards. The outstanding achievement was the award of the Beattie Cup for the best pen of five chiller steers at the Salisbury Show. The animals had to be not exceeding six teeth and weighing between 1,000 and 1,200 lb. live weight; 50 per cent. points were awarded by judging on the hoof and 50 per cent. on the hook. A Smithfield authority was present and commented very highly on the College exhibit, which won against very strong competition. The Slaughter Class judges congratulated the College and the students on the quality of Gwebi's entries, the manner in which the stock had been prepared for exhibition, and the general presentation and handling in the judging ring.

COMMITTEE WORK

The Principal was appointed Secretary of the Inter-governmental Committee on Tenant Farming, which involved him and the College office staff in considerable additional work.

PUBLICATIONS

A paper entitled "Maize Harvesting Methods at Gwebi Agricultural College", by the Senior Lecturer in Field Husbandry, was accepted by the *Rhodesia Agricultural Journal.* This paper describes the achievement of a 39.4 per cent. saving in labour when harvesting maize.

TOTAL REVENUE

During the financial year ending 30th June 1961, revenue from all sources at the College, including student fees, was £28,902.

CHIBERO AGRICULTURAL COLLEGE

J. W. WALSH, *Principal*

INTRODUCTION

THE YEAR UNDER REVIEW saw considerable progress made towards the aim of developing the College to the point where Course 1 students could be admitted on the 2nd October 1961.

STAFF

The Technical Assistant on the farm, Mr. J. Gibbons, transferred to the Department of Veterinary Services on the 30th December 1960 and was replaced by Mr. J. McC. Sinclair, Dip. Agr. (Gwebi), on the 1st May 1961. The post is now designated Field Husbandry Instructor.

Mr. P. J. Cuthill, B.Sc. (Agric.), took up duty as Lecturer in Animal Husbandry on the 4th March 1961; Mr. D. P. Hinton, B.Sc. (Agric.), N.D. Agr. (Eng.), as Lecturer in Engineering on the 1st August 1961, and Mr. A. Hartridge, B.Sc. (Agric.), as Lecturer in Agronomy on the 26th September 1961.

Mr. Timothy Nyakudya and Mr. Stephen Kutshwa joined the College staff on the 21st and 25th of September 1961, as Chief Cook and Hostel Supervisor/Medical Orderly, respectively.

At the 30th September 1961, the posts of Animal Husbandry Instructor, Engineering Instructor, Tobacco Instructor, Warden/Librarian and Administrative and Executive Officer were still vacant but, at the time of preparation of this report, there is hope of suitable appointees being found for some of the vacancies. The critical year of development of the College will be 1962–63, and it is to be hoped, therefore, that suitable staff can be recruited to enable this phase to be undertaken.

THE COLLEGE ADVISORY COUNCIL

Four full meetings of the College Council and one meeting of a Council sub-committee were held during the year. Matters of policy were discussed at these meetings and recommendations were made to the Minister of Agriculture. The Council, particularly the Chairman, was successful in efforts to provide scholarships and bursaries and sport and recreational facilities for the College. Nineteen scholarships have so far been established as follows:

The Government of Nyasaland	4
Messrs. Lever Brothers	3
Messrs. Caltex (Africa) Ltd.	2
The B.S.A. Company	2
The Imperial Tobacco Company	2
The Copperbelt Mining Companies	1
Messrs. Duly Ltd.	1
Mr. S. H. Leake	1
The Colonial Development Corporation	1
The A.P. and M.B. of Nyasaland	1
The Government of Northern Rhodesia	1

The Fertilizer Industry of Rhodesia has awarded one bursary.

The Sport and Recreational appeal was launched towards the end of the year under review, and a full report will be given next year.

BUILDING DEVELOPMENT AND PROGRESS

The contracts mentioned in the 1959–60 report were all completed before the end of September 1961, resulting in the following developments:

(a) A College tutorial and administrative block, comprising a library, an assembly hall, a laboratory, three classrooms and administrative offices and store-rooms.

(b) A College hostel block, comprising 40 single bedrooms with fitted, built-in cupboards, writing desks and book-shelves, two common-rooms, a dining-room, kitchen, cold-room, stores and a complete laundry unit.

(c) Sixteen staff houses of the standard three-bedroom-type, with built-in cupboards, lounge, dining-room, kitchen, pantry, bathroom and fenced-off plot area.

(d) A satisfactory residential and campus area road layout, including hard stands at the tutorial and hostel blocks, all tarred, and with an impressive main entrance.

(e) Forty semi-detached houses for 36 married and 16 single African employees.

With the limited recruitment of staff, it became possible to implement some of the farm and farmyard buildings and constructions which had been included in the overall planning. The progress was satisfactory. A dairy unit, comprising four double standings, a milk-room a wash-up room, an office, a feed store and a shower, was completed except for some internal plumbing and fittings. Management and handling facilities associated with this unit are making steady progress.

A large farm workshop/implement shed has been constructed and is now in process of being fitted out.

Although Mr. Hinton only assumed duty on the 1st August 1961, he had virtually completed the road bridge crossing of the Nyawiye River, referred to in last year's report, by the 30th September 1961, and this welcome facility will ensure the management and development of crops and paddocks on the eastern side of the farm.

FARM DEVELOPMENT

Significant but unspectacular progress has been made with farm development during the year.

An Irrigation Department drill arrived in October 1960 to sink an additional borehole. After one failure, a very successful supply was located on the eastern side of the Nyawiye River, the tested output being 4,000 gallons per hour. This has now been fitted out with a pump, engine and 4-in. main, to a tank site on high ground in the farmyard area. In doing so, provision was made for water to be tapped from this main for livestock utilization on pastures in the maize/grass rotation in the dairy, bull-pens and calf paddocks, and for possible irrigation in the vicinity of the farmyard area, as well as internal plumbing requirements of buildings, spray-race, ablution blocks, etc. A geophysical report indicates that there is a further site, approximately 70 yards from this new borehole, which may give an equally good supply of water. The 4-in. pumping main, already installed, will be adequate for this additional supply if and when required.

Considerable progress was made during the year in the implementation of the internal fencing programme, while further limited progress was made with the farm roads.

The maize/grass rotation block of some 60 acres was surveyed by plane table and a satisfactory conservation layout was approved by the local Conservation Officer. Preparation of 30 acres of this land, plus additional arable area on the eastern side of the farm, occupied a considerable portion of the 1961 winter programme work. As a result, it is hoped to have at least 80 acres under crops in 1962–63.

The hazards of use of the College farm are now well known, and they present a challenge to staff and students alike. We are confident that the challenge can be met.

THE 1960–61 CROPPING SEASON

Fifty-five acres were sown to crops in this season. The 28 acres of maize, planted to Double Hybrid No. 12, averaged 11¾ bags per acre, on 26.05 in. of rain between the 13th October and the 14th April, of which only 1.22 in. fell between 15th February and the 20th March. An additional hazard of cultivation was the heavy infestation of witch-weed, three hand weedings being necessary during the season. Other crops grown were sunflowers, Natal sugar-beans, velvet-bean hay, groundnuts and soya-beans for hay and seed.

On the completion of the rains, the usual fire-break control programme was instituted. It is pleasing to record that, for the second winter in succession, there have been no uncontrolled fires on the College farm, in contrast to the position in previous years. Past fire damage to the indigenous tree growth is reflected in the considerable number blown down in the past year. The control of veld fires will prevent this loss of a rapidly diminishing natural resource.

The planned programme of afforestation was initiated and wind/dust shelter belts in the residential and farmyard areas have been planted to Himalayan cypress.

LIVESTOCK DEVELOPMENT

A major feature of the year under review was the introduction of animals on to the College farm.

An accepted recommendation of the College Advisory Council was that pedigree Jersey and Black Polled Mashona herds should be established. As a result, the nucleus of a Jersey herd, consisting of three pedigree heifers, one grade cow and four grade heifers, were transferred from the Karoi Experimental Farm during August/September 1961. A number of offers of help with dairy foundation stock have been made by members of the Jersey Breeders' Association. In addition, six trained oxen were transferred from Karoi and 36 Blackhead Persian ewes have been transferred from Gwebi Agricultural College. From this beginning it is hoped to develop a sound livestock section, including pigs and poultry, to provide the necessary practical facilities for the College diploma syllabus.

ENGINEERING AND EQUIPMENT

The appointment of Mr. Hinton, late in the year under review, has meant that little development in that section has been possible. The Engineering Section's practical facilities will be required in the 1962–63 College year and, as already indicated, it is hoped to be more fully staffed for this critical phase of our development. Plans are now being made and the first implementation of these will be a new electrical reticulation in the farmyard area before the end of 1961.

During the year, additional equipment was purchased, and a certain amount of redundant and obsolete equipment was made available to the College on transfer from other Government stations. This is valuable in providing material on which students can gain practical experience.

An additional Ferguson "35" tractor and a Fordson Major tractor are to be provided in the 1961–62 financial year. Other C.M.E.D. equipment received on hire during the year included a new five-ton lorry and a new Land-Rover.

EDUCATIONAL

The prepared prospectus and syllabus was circulated to all schools in the Federation offering Form IV education for Africans. From time to time, additional publicity was given to the College by the press and radio in all three territories, and it can be reasonably claimed that knowledge of the College was extensive in the Federation.

To support this claim, 201 applications to come to Chibero had been received up to the end of August 1961. However, of these, 132 were mainly from applicants of only Standard V or VI. Forty of them were currently undergoing secondary schooling, hoping to qualify for Chibero in October 1962, or later. Of the remainder, five were from beyond the borders of the Federation.

This left 24 applicants, with the required entrance qualification, from which to select the first-year students of Course 1. From the beginning of the calendar year 1961 until the College was due to open at the end of September 1961, 15 of these applicants withdrew for a variety of reasons, some after having been offered a vacancy and provided with a scholarship, and one as late as two days before the first day of the term.

It has always been recognized that the College's minimum entrance qualifications were such as to be in direct competition with other avenues of higher education and employment. This natural factor has exerted a limitation on the number of potential Chibero candidates, but there can be no question that the demand will increase. In fact, at the time of preparation of this report, 30 applicants, qualified or about to qualify for entry, have applied for Course 2, and 13 of them have recently re-affirmed their intention to do the course if successful in obtaining the minimum entrance qualifications. Continued publicity and the ultimate demand for men with the College diploma are expected to foster the genuine desire to come to the College and study agriculture at a recognized diploma level.

It has been suggested that the College should admit married students. Married students, for whose families adequate provision has been made for the three years of the course, are given equal consideration and, in fact, two married students are already at the College.

GENERAL

Despite the limited staff for most of the year under review, members of staff were able to undertake visits as follows:

(1) The Principal made a trip to Mlezu Agricultural School, Que Que;

Fletcher High School, Gwelo; Luveve Technical Teachers' Training College, and Matopos Research Station during October 1960.

(2) Dr. J. N. Clatworthy made a trip to Gatooma Research Station, Matopos Research Station, Nyamandhlovu Pasture Research Sub-station and Tuli Experimental Station during March 1961.

(3) The Principal was a delegate to the Farm Mechanization Conference at the University College of Rhodesia and Nyasaland in May 1961.

(4) The Principal visited Nyasaland and Northern Rhodesia to interview and select students in those territories, also in May 1961.

(5) Mr. Cuthill, accompanied by the Chairman of the College Advisory Council, visited Karoi and Chalimbana Experimental Farms in July 1961.

All members of staff, particularly new appointees, made day trips to Gwebi Agricultural College, Henderson and Grasslands Research Stations, and to selected farms in Mashonaland.

The College staff also endeavoured to attend as many I.C.A., N.P.A., and other field days and Farmers' Association meetings in the district as pressure of other work would allow. It is worthy of mention that the Norton Farmers' Association held their September 1961 meeting at the College. This afforded staff the opportunity of describing the aims and objects of the College and of the farm plan, and an instructive discussion with a number of experienced farmers was most beneficial.

During the year, a large number of visitors from the Federation, other African territories and overseas visited the College. In particular, mention should be made of the two parties of African Master Farmers that visited both Gwebi and Chibero. They were most enthusiastic about the facilities being provided at the College.

The Principal served on two committees during the year. He was a member of Working Party No. 7 (Education and Extension) of the Advisory Committee on African Agricultural Production, headed by Professor J. V. Phillips. From February to September 1961 16 daily meetings, a two-day trip to Que Que Reserve and Gwelo, and a meeting with the full Advisory Committee were attended.

The Principal was also a member of the Commonwealth Training Week Committee, a total of eight meetings and the official opening of the week being attended during June–September 1961.

The Principal has been invited to be one of the panel of final judges in the Earl de la Warr Purchase Area Good Farming Competition being organized for the 1961–62 season under the auspices of the Natural Resources Board of Southern Rhodesia.

CONCLUSION

It has already been stated that the year saw considerable progress in the College development. It would be ungracious not to give thanks to those who have made this possible.

I wish, therefore, to express my very sincere thanks to all the members of the College staff for their loyal support and devotion to duty during a somewhat difficult year.

Our work has been greatly facilitated by much help and guidance from officers of the Department of Research and Specialist Services, other departments of the Ministry of Agriculture and the Secretariat of that Ministry, other departments and ministries, both Federal and Territorial, the College Advisory Council, and local organizations such as the Norton Farmers' Association and I.C.A. Committee. I am most grateful to them all for their help and guidance.

A special word of thanks is recorded to the Rockefeller Foundation of New York for the grant of $7,500 towards visual aids and library books for the College. This is a most generous gesture towards the success of this venture in the field of African higher education in the Federation.

To the many friends of the College, in particular to scholarship and bursary sponsors, donors of gifts in cash and kind to the Student Sports and Welfare Fund, and presentations to the College itself, I acknowledge with gratitude their generous help and value their friendship and goodwill.

Finally, I express my personal thanks to the Director and Assistant Director of the department for their continued support and guidance during the year under review.

REPORT OF THE FEDERAL DEPARTMENT OF CONSERVATION AND EXTENSION

For the Year Ending 30th September 1961

J. J. DUVENAGE, *Director*

INTRODUCTION

DURING THE YEAR under review a considerable amount of time and effort was devoted by all officers of the Department to the gathering of facts and their interpretation in the light of the Ministry's Crop and Livestock Production policy; the object being the achievement of an even greater measure of efficiency within the Department than before. As some of these facts had to be obtained from the Intensive Conservation Areas and from the individual farms the task has been a lengthy one, but the adoption of this approach has been worthwhile in that it will help to ensure that, in the future, emphasis will be placed upon the solving of the major problems of individual I.C.A.s; the collection and analysis of information has already produced an increased interest by the committees in their responsibilities.

In the future, this report will outline the progress that is made in the country towards the ultimate aim, which is the achievement of maximum economic production with the elimination of the misuse of natural resources.

A. GENERAL

(1) **Organization**

During the year the only posts upgraded were those of the Regional Clerks in the four Regions, and the Librarian's post in the Planning and Training Branch of Federal Headquarters, which was upgraded from Branch III, Scale E, to Administrative and Executive Officer (Branch I). A number of additional posts were authorized in the 1961–62 Estimates and these were:

One Additional Regional Conservation and Extension Officer for Southern Rhodesia.

Three Conservation Officers for Southern Rhodesia.

One Agricultural Draughtsman for the Conservation Engineering Branch.

Two Technical Assistants for the Conservation Engineering Branch.

One Clerical Officer for the Planning and Training Branch.

One Administrative and Executive Officer for the Conservation Engineering Branch.

One Conservation Assistant (Branch III) for the Planning and Training Branch.

One Survey Assistant (Scribe) (Branch III) for Northern Rhodesia (Regional Director's Office).

One Conservation Assistant (Scribe) (Branch III) for Midlands Region.

Three Survey Hands (Branch IV) for Southern Rhodesia.

One Office Orderly (Branch IV) for Federal Headquarters.

It should be noted here that one Senior Pests and Weeds Advisory Officer and seven Pests and Weeds Advisory Officers were transferred to this Department from the Department of Research and Specialist Services. These officers fall under the Senior Conservation and Extension Officer and are directly responsible to Group Officers in the areas which they serve.

(2) **Staff**

The past year has not been an easy one in that the Department lost the services of 25 professional officers and six Departmental Grade personnel due to resignations and transfers. Transfers and promotions have also affected six posts in the clerical and executive field. Recruiting proved to be extremely difficult and there is no doubt whatsoever that the paramount reason has been the very low level of salary offered on appointment to the Service and, in addition, the fact that salary scales in general are not particularly attractive to professional men.

At the beginning of the year under review the Chief Tobacco Extension Officer, Mr. C. Rose, resigned and was succeeded by Mr. R. J. C. Hope, Senior Tobacco Extension Officer for Northern Rhodesia, whose place, in turn, was filled by Mr. J. Jameson.

VISITS TO OTHER COUNTRIES

Through the generosity of organizations such as the International Co-operation Administration, Food and Agricultural Organization and the Federal Government, it was possible for certain members of the Department to visit the U.S.A., Britain, Holland, Israel, Sudan and the Republic of South Africa.

These visits are of the greatest possible value to those who have been able to make them and are in the interest of the Service. The officers concerned who have undertaken these tours are greatly strengthened in the broad field of agricultural knowledge and techniques and, in consequence, are of more value than ever to their colleagues in the Department and to the farmers whom they serve.

Details of the individual visits are given below:

(a) The Director of Conservation and Extension, Mr. J. J. Duvenage, attended the CCTA/IUCN symposium on "The Conservation of Nature and Natural Resources in Modern States" held at Arusha, Tanganyika. While in Kenya, Mr. Duvenage took the opportunity of visiting European farms, African land consolidation schemes, the Maguga Research Station and the East African Machinery-testing Station.

(b) The Senior Conservation and Extension Officer, Mr. J. C. Harper, under the auspices of the International Co-operation Administration, visited the U.S.A. and United Kingdom to study—

The problems of land settlement in new areas, tenant and other settlement farming schemes, subdivision of land, and methods of financial assistance to impoverished and distressed farmers.

Extension programmes, natural resource education, teachers' courses, 4-H clubs and the organization and administration of field staff in conservation and extension.

The observation of university courses in public administration and communications.

(c) Group Conservation and Extension Officer, Mazoe Group, Mr. A. J. Collet, under the auspices of the International Co-operation Administration, visited the U.S.A. and United Kingdom studying extension methods, integration of livestock in intensively farmed areas of the American Corn Belt, beef production in high-rainfall areas, and the organization of farm-controlled co-operatives.

(d) Irrigation Officer, Mr. A. N. Orner, of the Midlands Region, under the auspices of the International Co-operation Administration, visited the U.S.A., United Kingdom, Netherlands, Israel and the Sudan studying procedures in applying irrigation water on steep land, economics and designs of irrigation systems, land-forming practices to control erosion, measurement and evaluation of water intake rates of soil, extension methods and communications.

(e) G. D. Goldthorp, Irrigation Officer, Northern Rhodesia, visited irrigation projects, research stations, citrus estates and farms in the Republic of South Africa to study irrigation methods and techniques.

(f) P. R. Francis, Poultry Officer, while on leave in the United Kingdom, took the opportunity of attending the National Poultry Show and Poultry Convention in London and visited breeders, hatcheries and broiler plants to study the rapid changes which are taking place in the British poultry industry and their possible effect on the Federation.

(g) J. Jameson, Senior Tobacco Extension Officer, while on leave in the United Kingdom, studied aspects of cigar-leaf marketing in Britain, Holland, Germany and Denmark.

(h) H. A. Squire, Officer-in-charge of Work Study, also while on leave in Europe, was given the opportunity of studying the latest development in work-study methods in relation to agriculture in England, Holland, Denmark and Sweden.

(i) The Director of Conservation and Extension, Mr. J. J. Duvenage, accompanied by the Chief Planning and Training Officer, Dr. V. Vincent, attended a seminar on extension methods held in Pretoria.

(j) The Senior Research Officer, Mr. N. Hudson, took study leave at the University of Cape Town, studying erosion control, and also attended the CCTA Inter-African Hydrological Conference in Nairobi, Kenya.

(k) Conservation and Extension Officer, Mr. G. Carew, took the opportunity while on leave in the United Kingdom to study aspects of dairying.

Representation on Committees

The Director and/or the Deputy Director served on the following committees and working parties dealing with matters concerning the Federation:

Federal Standing Committee on Agricultural Production.
Tobacco Research Board.
Gwebi College Council.
Field Experimentation Committee.
Council of the Rhodesian and Nyasaland Association of Young Farmers' Clubs.
Commodity Committees dealing with groundnuts, soya-beans, sunflowers, sorghums and banana production.
Inter-governmental Committee on Tenant Farming.
Farm Mechanization Standing Committee.
Mashonaland Cattle Council.
Research Advisory Committee.

They also served on the following committees and working parties concerned with matters pertaining to Southern Rhodesia:

Livestock Improvement Committee.
Natural Resources Board (Advisory).
Water Resources Committee of the Natural Resources Board.
Conservation Education Committee of the Natural Resources Board.
Subdivision of Land Committee of the Natural Resources Board.
Native Affairs Committee of the Natural Resources Board.
Mineral Resources Committee of the Natural Resources Board.
Sabi Development Committee.
Land Settlement Board.
Sabi Development Farm Committee.
Bothashof School Council (Government representation).
Native Department Working Parties Nos. 1 and 5.

The Deputy Director served on the following committees and working parties dealing with Northern Rhodesian farmers' finance:

Consolidation of Farmers' Debt Committee.
Working Party Investigation into Farmers' Finance in Northern Rhodesia.
Working Party Investigation into the Future of the Farmers' Debt Adjustment Board (Chairman).

Other senior officers of the Federal Headquarters staff also served on some of the above and many other committees.

Publications

Officers of the Department published numerous articles in the *Rhodesia Agricultural Journal, Rhodesian Farmer* and other publications. See Appendix I.

B. SPECIALIST ADVISORY SERVICES

(1) **Planning and Training**

Facing the Branch at the beginning of the year were the following major tasks: the establishment of a Training Section; the establishment of a Farm Management Planning Section; the development of the embryonic Work Planning Section.

Each involved the establishment of policy, the development of procedural guidance, the establishment of lines of responsibility and communication to integrate it within the existing framework of the Department and the development of training programmes and subject material.

Only two officers were engaged full time on work planning until September, when three posts, made available by finance from the Rhodesia Tobacco Association, were filled.

a. Land-use Planning

(i) Aerial Photography

During the year all the Department's requirements for photography were fulfilled. All flying was done on a scale of 1 : 40,000 at the request of the Director of Federal Surveys. Investigations into the possibilities of flying the whole of Southern Rhodesia, on a six-year programme, were undertaken. (Discussions with other departments interested in aerial photography for photo-interpretation purposes indicte that considerable advantages could be gained by all concerned if blockflying on a long-term programme could be introduced.)

Special photo-interpretation exercises covering 149,000 acres on four units were conducted by the Branch for preliminary investigations into land-use potential. The requests came from the Southern Rhodesia Department of Native Agriculture, development companies and private individuals.

(ii) Land Classification

Soil. Much time was devoted to more strenuous efforts to achieve the highest possible standard of mapping by field staff. Standards generally have been good and the main problems have been encountered at the "unit delineation stage" of land classification.

Vegetation. Ranch planning procedure involves the survey of vegetation by homogeneous areas through specific vegetation transects, which are recorded and analysed in detail.

(iii) Land Use Planning Progress

Farm and Ranch Planning. Progress has fallen off during the past two years. However, the figures of output must be read against other departmental activities, which conflict in their demand for the time of field staff.

The following table shows the progress that has been made in this field since the introduction of the present system of planning:

Year ending 1957	68
Year ending 1958	218
Year ending 1959	631
Year ending 1960	440
Year ending 1961	337

The output of plans by Regions for the year is shown in the following table; figures for the previous year are given in brackets:

Region	*Plans Completed*	*Acreage Classified*	
Mashonaland	141 (176)	358,819	(518,216)
Midlands	58 (116)	256,040	(539,510)
Matabeleland	46 (57)	1,389,133	(722,551)
Eastern	32 (44)	136,431	(186,002)
Sabi Team	60 (47)	173,194	(170,065)
	337 (440)	2,313,617	(2,136,344)

Totals to date:

Total number of farms planned	1,694
Total number of acres classified	7,799,061

The output of initial development plans during the year under review was:

Mashonaland Region, 57 farms	213,200 acres
Midlands Region, 1 farm	6,350 acres

Regional Planning, Northern Rhodesia. See Section C, Northern Rhodesia.

(iv) Catchment Planning

Sabi Catchment. The Sabi Planning Team completed work in the Macheke I.C.A. in May, and moved into the Rusape I.C.A. for the remainder of the year.

Wye and Condo Catchments. During the four years of planning roughly 1,000,000 acres of the total Condo Catchment area have been planned. The breakdown of the 1,000,000 planned acres is as follows:

	Acreage
Farms planned by the Sabi team, 198	566,851
Farms planned by the local staff, 88	257,072
Initial development plans by local staff, 2	178,000
	1,001,923

Kyle Catchment. Work in the Kyle Catchment progressed most favourably during the year. Farm-planning work continued to a point where practically all farms in the European areas of the catchment are now planned or being planned. In addition a great deal of Section 23 work was satisfactorily completed.

Implementation surveys were carried out in the Macheke and Marandellas West areas and preliminary findings were most encouraging. It is generally felt that implementation of farm plans in the Sabi Catchment is progressing at a favourable rate.

(v) SECTION 23 WORKS

Two major storage dams were constructed last year in the Wye Catchment under section 23 of the Natural Resources Act. These two dams cost £17,000 and both filled during the rains.

(vi) SPECIAL ASSIGNMENTS

During the year a number of special assignments were undertaken by the Branch. These accounted for a considerable amount of working time and among the special jobs undertaken were:

A special investigation into land-use problems in Native Areas of the lowveld, carried out at the request of the Territorial Minister of Native Affairs.

Special investigations into two ranches with irrigation potential. This work was undertaken in collaboration with the Soil Survey Section of the Chemistry Branch and was aimed at giving guidance on the possibilities of large-scale company development.

That which concerned African agriculture—assistance was given to three working groups of the Department of Native Agriculture on the development of policy and techniques, and on four of their training courses on planning.

b. Work Planning

(i) ADVISORY WORK WITH FARMERS (Extension)

A total of 488 visits to individual farmers was made during the year. Of these visits, all were at least partly advisory in character and at least 330 of them were mainly to advise on the application of the recommendations of the *Tobacco Work Study Manual.*

Forty-four farmers' meetings, field days and discussion groups were addressed and/or attended by Work Study officers.

(ii) COLLECTION AND EVALUATION OF DATA (research)

This work had two main aspects, viz., the checking and modification of existing data in the Rhodesia Tobacco Association's *Manual* and the preparation of further sections on new methods as supplements to it.

Modifications and Corrections. The sections on land fumigation and on reaping with the Kurt machine had to be drastically revised. Revisions were due to a change in Research Board recommendations in one case and to the discovery of a major error in calculation in the draft *Manual* in the other. These revisions were completed in time for their incorporation in the final printed *Manual* as issued to growers.

In fact, throughout the year the *Manual* was being "tested" against practical conditions on farms and a few other doubtful points, which are still being investigated, were discovered.

New Methods. The latter half of the reaping season was largely devoted to a detailed study of new reaping and handling methods which had not been covered in full or at all in the *Manual.*

c. Farm Management

The development of sound extension techniques in farm management has been given top priority, and a preliminary draft of notes on Farm Management Recording and Analysis has been prepared. These will be given out and used in the staff training courses in Farm Management that are to be organized for all staff.

Techniques are being developed to deal with the two primary requirements of the Department in the farm management field, viz:

The examination of farm plans drawn up from physical surveys for soundness from the economic aspect.

The examination of farmer records and the giving of advice on enterprise management when requested.

New aspects of the work to be developed include the provision of standard models, promotion of management recording and analysis of field records as they become available.

d. Training

Induction training for new recruits has been systematically broken down into six stages, extending over a period of approximately eighteen months. This includes the three formal training courses, i.e., Part I (Mechanical Conservation), Part II (Biological Conservation) and that concerned with Farm Planning. Provision is also made for evaluation of standards reached by recruits in practical work, and the effectiveness of the courses.

In the course of the year, twenty-one recruits underwent induction training, and seventeen courses gave training to 254 officers of this Department and the Territorial Departments of Agriculture.

TRAINING FOR TEACHERS

The Heany Teacher Training College trains many of the Federation's future primary school teachers and is regarded as the keystone of the conservation education programme. In January, a special course was run for new members of the Heany staff. As a result, the College's approach was reappraised, and a new approach was introduced whereby conservation classes for students were concentrated into one month.

A two-day Wildlife Conservation Conference was held at Bulawayo in May, arranged jointly by this Department and the Bulawayo Conservation Education Committee. It aimed at providing a background for conservation work and was attended by 36 teachers. A public evening, dealing with this particular subject, was attended by 300 people in Bulawayo.

Experience in 1960 indicated that field visits for teachers tended to be held in a few centres too frequently, with a resultant decline in attendance. Consequently, this activity was not pressed during the year. Organization of this activity is steadily moving from the Department and the Natural Resources Board to local conservation education committees, which is a sound trend.

Considerable time was devoted to the development of the Department's library as an information service. A comprehensive system of indexing has been established.

e. Young Farmers' Clubs

During the year the transfer of sponsorship of the movement from the Department to the Natural Resources Board of Southern Rhodesia was implemented. This has taken some considerable time and there have been numerous difficulties to overcome.

The Advisers have assisted greatly in this work. There has, unfortunately, been a decline in Young Farmers' Club activities, but it is anticipated that better progress will be made in the future. The present position is as follows:

Number of European, Coloured and Asian Clubs in the Federation	60
Number of new Clubs in 1961	6
Number of Clubs closed in 1961	9
Number of Training Events in 1961	12
Number of Organizers (N.R. and S.R. Governments)	2
Number of Advisers (Conservation and Extension)	2

(2) Engineering

a. Introduction

Progress during the year under review was considerably hampered by staff shortages and as a result some of the services given by this Branch have fallen short of what has been required.

b. Farm Machinery Advisory Services

The Farm Machinery Engineer, Mr. E. Templeton, was transferred to Gwebi Agricultural College in July and, as a result, advice given to farmers in this particular field was greatly curtailed. The vacancy has been filled by Mr. A. J. Spear from the National Institute of Agricultural Engineering in Britain, who is expected to assume duty in January 1962.

The major event of the year was the Farm Mechanization Conference held at the University College of Rhodesia and Nyasaland. The conference proved to be a great success and was very highly spoken of by all the attending delegates. One of the major resolutions of the conference was that there was a need for a more effective farm-machinery advisory service. The demand for farm-machinery advice has grown steadily until it is now virtually impossible for the present staff to cope with all requests.

A further recommendation of the conference was that a Farm Mechanization Standing Committee should be set up to represent farmers, the trade and Government, to deal with all aspects of farm mechanization.

In the field, the mechanization of groundnuts is making progress. Suitable lifters have been used by farmers and double-row planting on the ridge is expected to be done by machines, modified or developed for this purpose, in the coming season.

c. Farm Buildings Advisory Service

The demand for advice in the farm buildings field continued to grow during the year. A total of 1,316 requests for advice was received of which 25 per cent. were in connection with tobacco buildings. Considerable interest is, however, also being shown in large-scale bulk maize storage and handling facilities on farms.

An investigation during the year into the value of farm buildings and structures in the European areas of the Federation showed that the value of farm buildings is at present £37.3 million with an annual repair and maintenance cost of £745,000. It is therefore not surprising that the present staff in the Farm Buildings Advisory Service are unable to cope with the demands made upon them—particularly when it is remembered that only a relatively small proportion of farmers can be reached by these officers.

During the year 31 discussion groups and field days on farm buildings were held and were attended by approximately 500 farmers.

A number of articles and drawings were published during the year and the demand for them has shown the increasing interest which farmers are taking in the proper construction and maintenance of their buildings.

d. Erosion Control Research

(i) General progress

The revision of the research programme undertaken in November 1960, together with some staff increase, has made the operation of this programme much more efficient, and the effect will be even more noticeable in the future. Good progress is now being made in the assessment of data previously collected and a great deal of information will soon be available for publication.

During the year the following changes took place: Several experiments were discontinued as they had either served their useful purpose or were not giving worthwhile results; the Senior Research Engineer delegated to the Research Officer responsibility for operating the field experiments in order to allow the Senior Research Engineer time to do practical research. A European Technical Assistant and a Computation Assistant were appointed to help with field experiments and the handling of results respectively.

(ii) Report on present programme

Experiment 2 (Length of Slope or Contour Spacing Experiment) was determined on red soil, and rebuilt on Series III (sand soil) as Experiment 25. During the 1960–61 season it had a calibration period and is ready for full operation in the coming season.

The mosquito-gauze experiment demonstrating the effect of cover was repeated on Series III (Experiment 3 S) and will also be in full operation for the 1961–62 season.

Experiment II/6. As sufficient information has been obtained on the effects of different rotations on Class I and II red soil, recording was discontinued. Crop tests are still applied, and the recording equipment maintained so that check measurements of long-term effects may be made in several years.

Experiment I/4. This experiment is intended to compare the effect of different periods of grass and maize in rotation. As short-term changes were not detectable this experiment has been put on the same footing as Experiment II/6, i.e., treatments will be applied ready for test recording in several years time.

Experiment I/5. This was not strictly an experiment, but a demonstration of the effect that soil slope had on alternative ploughing methods. The effect which would ordinarily arise after 20 or 30 years' ploughing was achieved by ploughing several times each year for seven years, and the changed slopes have now been stabilized by planting grass to form a permanent demonstration.

Experiment 13. The effect on surface run-off of using either stubble-mulching or trash-farming methods in maize production was tested on a field scale for several years. As it has been clearly shown that both methods are equally effective, the experiment has served the original purpose, and so recording has been discontinued. However, interest remains in the long-term agronomic effects of these cultivation methods so the experiment will continue to be operated as an agronomy experiment by the Department of Research and Specialist Services.

Joint Evapotranspiration Project. This project has been on a care and maintenance basis since staff changes disrupted the original experimental team. Crop treatments have been applied but no recordings have been taken. Future direction and control of the project has now been transferred to the Chemistry Branch. All other field experiments continue unchanged.

Study of Rainfall Characteristics. Good progress has been made in this study, and the first phase, the measurement of the physical characteristics of high intensity thunderstorm rain, was completed during the 1960–61 season and the main results were published. The second phase is the application of the new information to the design of a rainfall simulator for use as a research tool.

Laboratory Study of Fertility Losses. Again good progress may be reported. Almost all of the back-log of laboratory analyses were completed during the year, and much of the data has been statistically examined, and will be published soon.

e. Water Management Research

The object of this work is to make the wet areas of the country profitably productive and, at the same time, to discover ways and means of using the surplus water in crop, pasture or other fields of production and to determine the effects of such use upon stream flow.

Trials have been installed in a variety of soils and under different conditions in the higher rainfall areas to measure both surface and subsurface flows and to determine the permeability of soils. The considerable data now available is being collated and processed; work done to date indicates that the subsurface flow is a complex one which depends to a large extent on the underlying geological factors.

It has become obvious that the work will have to be extended into two new fields, viz., catchment hydrology, in which a study is made of the water cycle within catchments; and land use, in which the productive use of vlei lands is studied.

(3) Tobacco Advisory Services

a. Staff

There are 49 officers trained in tobacco extension of which 34 are in the field at the level of Group Conservation and Extension Officer or Conservation and Extension Officer. Of the remaining 15, three are Tobacco Branch specialists and the rest are in other specialist posts such as Irrigation and Work Planning while some have been promoted to more senior posts in the Department.

b. Tobacco Training

Through the years it has been apparent that the normal wastage of trained staff was making it difficult to improve the service to the farmer. The system of training officers in tobacco work by placing them with farmers for a season, coupled with visits to Tobacco Research Board stations during that and subsequent seasons, has produced officers of high calibre, but it suffers from drawbacks. The officer is lost to his normal duties for almost a year, and the number of officers

who could be trained each year was limited to between four and six. Thus the balance between newly trained officers and those leaving the service was barely maintained.

A new form of training has been instituted by which it is intended to produce a larger number of trained officers without lowering the present high standards. In conjunction with the Planning and Training Branch and with the active co-operation of the Tobacco Research Board and other Government departments, 18 officers are being trained on an in-service basis. These officers attend courses each month lasting from three to four days, which are designed to give a thorough grounding in both the theoretical and practical aspects of all operations connected with the production of tobacco.

Both the farm training and in-service training methods have disadvantages and advantages in comparison with each other, but on balance the new method should be capable of producing officers with a wider background over all fields except in that concerned with the direct management of labour. However, the farm-training scheme has not been abandoned, and four officers are undergoing training on farms, making a total of 22 officers undergoing training this season. As most of the trainees are at the level of Conservation and Extension Officer, there should be a direct benefit to the Group Officer, as much of the routine tobacco advice will be given by the Conservation Officer.

c. Commercial Grading

During the year the responsibility for the inspection of commercial grading sheds was removed from this Department and undertaken by the South-Western Tobacco Marketing Board. This change is welcomed as it had become obvious that to give the work the attention it required, it would be necessary to employ one man almost full time on these duties. A close liaison is maintained with the Inspector employed by the South-Western Tobacco Marketing Board to carry out these duties.

d. Tobacco Research Board

The excellent relationship which has always existed between this Department and the Tobacco Research Board has been continued. The Board has undertaken a great deal of work in connection with the increased training that is being given to field officers of the Department. Arrangements have also been made for Extension Officers to visit tobacco research stations more frequently this year. This assistance is greatly appreciated.

e. Rhodesia Tobacco Association Survey

At the request of the Rhodesia Tobacco Association a large-scale survey was undertaken on approximately eighty farms. This was in two parts; first the collection of data concerning the crops from seed-beds to the final sale by bales; secondly, the evaluation of the results to discover whether there was any clear pattern to the occurrence of "off-type" tobacco. This Department has been responsible for the first part of the survey and the Tobacco Research Board is undertaking the second part. It has been a most involved and time-consuming exercise but, if the results are of value, it will be of the greatest importance to what is the major agricultural industry of the Federation.

f. Field Trials

Co-operative off-station experiments were run in conjunction with the Tobacco Research Board as in previous years.

g. Rhodesia Tobacco Association, South-Western Tobacco Marketing Board and Tobacco Export Promotion Council of Rhodesia and Nyasaland

Close and profitable liaison was maintained with the above organizations. The Department assisted very materially with the production of the R.T.A. *Work Study Manual*, which will be a very powerful tool in the hands of both growers and Extension Officers.

The Department has the responsibility of advising on the use of the *Manual* as well as keeping it up to date.

h. Central Africa Turkish Tobacco Association

Close contact was maintained with this body. The promotion tour in Matabeleland was arranged by the Department, and the Chief Tobacco Extension Officer took part in it. Assistance has been given with the preparation of the handbook for Turkish growers. The Senior Tobacco Extension Officer has been co-opted to

serve on the council of C.A.T.T.A. to represent Northern Rhodesian growers of Turkish tobacco until a farmer representative from that area is appointed.

i. Visitors from Outside the Federation

A number of visitors from outside the Federation were assisted in their tours in connection with the tobacco industry. Among these visitors were four growers from Madagascar, one member of the Japanese Monopoly, and three government officials from Tanganyika and Portuguese East Africa.

j. The 1960–61 Tobacco Crop

(i) flue-cured tobacco

The sales of the 1960–61 crop produced new records both in weight sold and in gross return. However, it was most noticeable that tobacco from certain areas, particularly those that are lower-lying and warm with adequate rainfall, sold much better than higher altitude areas, or areas that suffered delayed ripening.

Climatic Conditions. Throughout the Federation the total rainfall was adequate and its distribution generally satisfactory, except that in some areas ripening was delayed by alternating dry spells and wet weather. This resulted in the leaf becoming thick and of lower value.

Hail was fairly widespread during the first half of the season. Late rains, while having no effect on the 1960–61 crop, helped in the preparation of lands for the 1961–62 crop.

Land Selection. More farmers are availing themselves of the advice available on the selection of soils best suited to tobacco, especially in relation to the time of ploughing.

The early selection of soils is becoming more important in view of the fact that many of the soils, especially when reverted or rotated, are showing an increasing need for lime applications to maintain satisfactory pH levels. However, careful planning is still needed by a high percentage of the growers.

Land Preparation. The early-ploughed soils are generally well prepared and present no problems. However, the grower who has to use late-ploughed soils is faced with the major problem of getting them into good tilth for the early planting, which is now obligatory. Soils are being subsoiled after the cessation of the rains so as to facilitate late ploughing with the relatively light equipment available. Rollers are also being used to breakdown clods. Unfortunately, the magnitude of the task, with its attendant costs, is causing some growers to turn to early ploughing and second-year tobacco on unsuitable soils, in the hope that high yields will offset unsatisfactory prices.

Land Layouts. More emphasis needs to be given to the benefits that can be derived from planning the land layout in relation to the planting and reaping methods that are to be used. The reduction of labour requirements and less handling of leaf at peak periods can give both direct and indirect benefits.

Fertilizers. There has been no change in the range of recommendations used by the field staff. The Department has always been against the high use of both nitrogen and phosphate. In the past many growers have used excessive quantities of either one or the other, and there is now an obvious swing to the lower range of the fertilizer bracket for each particular type of soil.

Liming recommendations based on chemical analysis are also on the increase.

Seed-beds. Despite all the information at their disposal and favourable weather conditions, too many growers ran into avoidable trouble, usually as a result of incorrect watering or faulty application of fungicides or insecticides; the management of mulch also led to difficulties.

Planting Out. Early planting is now general practice, 75 per cent. to 80 per cent. of this last season's crop being planted before the end of November, mostly with water. Only 12 per cent. of the crop was planted out after Christmas. Excellent stands were obtained in the earlier plantings and disease problems were not severe. In the late plantings, however, bushy-top caused an 80 - 100 per cent. write-off on individual lands.

Crop Progress. The crop grew well, but there were several dry spells before topping began in many areas. Topping and suckering were generally satisfactory, but due to delayed ripening because of alternating wet and dry spells, a large proportion of the leaf grades was held on in the lands, causing the leaf to become thick and of poor texture. While tobacco of this type had sold relatively well in

previous years, it received very poor prices this year. In contrast with this pattern tobacco that had grown out fast in the lower altitude areas, ripened quickly, producing leaf with good stretch and other desirable characteristics which sold remarkably well.

While barn space was still inadequate this had little effect because the rate of ripening was slow, but there was a tendency to rush the cures to obtain a quicker turn-round of barn space. This was a retrogressive step as it was apparent that the quality of the leaf was lowered by too rapid curing.

Curing, Bulking and Grading. The main curing problems were associated with rushing the cure, sponging, the spoiling of bottom-tier tobacco and defective barns. This last-mentioned fault was often caused by part of the system (e.g., top vents) having been altered without compensating alterations being made to flues, furnaces, etc.

Colouring periods were fairly normal, most of the time saved on the quick turn-round being a result of rushing the temperature rise between 100° and 140° F. Chemical changes in the leaf were not allowed to proceed normally to completion, and flat, close-grained leaf resulted.

There has been an increase in the number of barns, but the position has not yet been reached where there are adequate barns to cope with a rapidly ripening crop.

Bulking techniques have not shown any marked change and there is room for improvement. Colour changes in the bulk caused some concern during the season being reviewed.

Farm grading was of a relatively high order compared with world standards and the methods suggested by work study specialists have been applied on some farms with good results.

The efficiency of curing, bulking and grading operations can all be improved by greater attention to uniformity of the crop from seed-beds onwards.

Diseases and Pests. With the exception of "bushy-top" infection in the tobacco planted in December, there were no serious problems. Anthracnose was well controlled.

Rotations. Approximately 20-30 per cent. of the crop was grown on rotated soils and this proportion will increase. Certain problems connected with the build-up of fertility are becoming obvious and work is being carried out on these problems.

Fumigation. The use of nematode fumigants in the lands has increased; work on rotations has shown that four years of a recommended grass ley reduces the nematode population to the degree where fumigation is not necessary, and this in turn may lead to an increased rate of pasture establishment.

Irrigation. The very early irrigation of tobacco has largely been discontinued, but increasing use has been made of supplementary irrigation to reduce the effects of mid-season droughts.

Work Planning. The issue of advance copies of the *Work Study Manual* to selected growers caused widespread interest, which has been further stimulated by the issue of *Manuals* in loose-leaf form to all growers. Work planning will play an increasingly important part in the production of the crop in years to come.

Sales. The total amount sold from the South-Western Area was 233,349,259 lb. for an overall return of £32,879,152 at an average price of 33.82d. per lb. from 224,613 acres. This gives an average yield of 1,039 lb. per acre.

There was a steady and good demand for the top quality tobacco, fully ripe, open-grained, with good oil and stretch. Because much of the leaf was too thick and heavy the demand for these types of mahogany grades was very poor. As a consequence the demand for primings and lugs of good quality was generally satisfactory.

(ii) TURKISH TOBACCO

Turkish production has always been erratic and the incidence of bushy-top during the 1960–61 season was so severe that the yield was virtually halved to an estimated 945,000 lb. The problem is very serious, as it is not possible to prevent infection. Two lines of approach are being tried, firstly to plant early to avoid the aphid build-up and secondly to grow more of the crop in Matabeleland where bushy-top infection has been slight.

Approximately thirty new European growers will try the crop in Matabeleland during the 1961–62 season and an experiment is to be conducted there by this Department in conjunction with the Tobacco Research Board. It is possible that Matabeleland could become the major Turkish producing area of the Federation. Good markets exist for the crop and it is of great importance to maintain supplies.

New methods of machine-tying the leaf and labour-saving curing racks are being developed. Although most of them have defects of varying seriousness it is along these lines that more efficient means of handling the crop can be expected.

(iii) BURLEY TOBACCO

Yields and prices for the North-Eastern crop were satisfactory and the previous expansion is likely to continue. This tobacco is of the heavier "Nyasa" type. The North-Eastern crop amounted to 900,000 lb. off 1,300 acres and was sold at an average price of 25d. per lb.

After the previous market failure, the demand for the fluffy type of cigarette Burley revived late in 1960, and a small acreage was planted rather late in the season. However, reports on the small varied crop have been favourable, and an effort is being made to produce approximately 200,000 lb. with some 90 to 100 growers participating on a trial basis. It is anticipated that for the foreseeable future the demand for this fluffy Burley will far exceed the production. Many problems, mainly in the curing and economics of large-scale building construction, remain to be solved. There is no doubt that the crop can be grown in the Federation, but for large-scale production to be successful, farmers will have to learn a great deal about Burley tobacco work in a short time.

(iv) CIGAR TOBACCO

Approximately nineteen acres of cigar tobacco were grown at Melsetter and the Vumba to enable the Department and interested farmers to investigate the possibilities of producing good wrapper leaf. The problems facing this venture are basically a complete lack of accurate knowledge about every phase of production in relation to the area, such as varieties to plant, soils and fertilizers to use and production methods to employ. With the assistance of Mr. Mattern of this Department the leaf was grown, cured, fermented and graded. Samples were taken to various dealers and manufacturers in Europe by the Senior Tobacco Extension Officer and Mr. Eccles of the Forestal Company, and a report was submitted which indicated a considerable variety of opinion on the worth of the tobacco. Work is to continue on a rather smaller scale with the Tobacco Research Board undertaking a trial at Melsetter, and a limited trial being done by this Department on the Copperbelt. As yet it is too early to judge what future can be expected for cigar wrapper production in the Federation. The immediate course of action is intended to supply basic information and at the same time to let good quality wrapper leaf reach the market. Once the threat of homogenized leaf either materializes or disappears growers will be in a better position to go ahead, or if necessary, drop the production of wrapper leaf.

(4) **Tobacco Pests and Weed Advisory Service**

As from the 1st July 1961, the Tobacco Pest Inspectors and Weeds Officer were transferred from the Department of Research and Specialist Services to this Department.

a. INSPECTIONS: TOBACCO FARMS AND PREMISES

The number of inspections made of tobacco farms and premises during the year in each area was as follows:

Eastern Area	664
Bindura Area	699
Sinoia Area	999
Midlands Area	605
Salisbury Area	638
Hartley Area	482
Northern Rhodesia	461
TOTAL	4,548

Three inspections were made of the tobacco tranship sheds in Beira. No live pests of tobacco were seen or found on these visits and the cleanliness and treatment of the sheds were found to be satisfactory.

In addition to the visits to and the inspections of the Beira tranship sheds some 40 visits were also made to the Salisbury industrial area for the purpose of examining tobacco for export, issuing phytosanitary certificates, checking on insects found in tobacco and carrying out routine checks on premises after and during fumigations and DDT treatments.

b. Prosecutions

Ten successful prosecutions were made against farmers who had failed to comply with the requirements of the regulations.

c. Pests

"Bushy top" disease, whilst not scheduled, was very noticeable in both growing tobacco during the season and in regrowth plants found in some lands after the final date for destruction.

d. Minor Irregularities

In addition to the above there were a large number of minor contraventions of the regulations. The main ones concerned: volunteer plants found in lands and seed-beds, dead stalks or pieces of dead stalks found lying on the surface of lands and tobacco rooms not being cleaned by the required date.

e. Weed Control

The most important weeds dealt with were the aquatic noxious weeds *Salvinia auriculata* and *Eichornia crassipes*, the infestations being mainly in the Odzi and Tsungwesi I.C.A.s. These could seriously affect a possible Sabi Scheme. Further infestations exist on the Hunyani River and in the Rusape area. Two massive clearing operations have been carried out but responsibility for clearing and eradication is now that of landowners and I.C.A. committees.

(5) **Irrigation Advisory Services**

a. General Progress of Irrigation

Irrigation farming maintained a steady rate of increase during the year. These last 12 months proved to be better than the previous year — the rainfall was higher and water was available for irrigation in the drier parts of the country.

The biggest increase in irrigation is taking place below Kyle Dam where, it is estimated, about 14,000 acres of sugar-cane are now planted. Water from Kyle Dam was made available this year for the first time, which resulted in a very rapid expansion of the sugar-cane crop. An estimated 8,000 acres of sugar-cane were planted out this past year.

b. Irrigation Layouts

There continues to be an improvement in irrigation layouts and in the control of water. More care is being taken in the preparation of lands and farm-built land-planes are now to be found in many parts of the country.

c. Staff

All posts in the Irrigation Advisory Service are now filled, this being the first occasion for a long period that officers were available full time. During the year Irrigation Officers made a total of 259 advisory visits to farmers.

d. Training Courses and Publications

Only one intensive training course was held for staff members; 18 officers from this Department and two from Native Agriculture attended. Nearly all officers who have a reasonable amount of irrigation in their areas have now been through these courses. Shorter series of lectures were given to staff and to Gwebi students.

A total of 20 farmers' days and discussion groups were addressed, the emphasis in each case being on aspects of irrigation.

e. Major Schemes

The Umshandige and Umgusa schemes continue to make satisfactory progress. Barley and wheat are still the main winter crops at Umshandige, and dairying and the growing of fodder crops are the main activities at Umgusa.

The Triangle Sugar Estates and the Hippo Valley Citrus Estate are receiving water from the Kyle Dam and can now commence their main expansion. There are seven settlers at Hippo Valley and they are all busy planting cane. Due to better layouts and application of water the yields of cane per acre are improving steadily.

In the Sabi Valley the closing down of the Sabi-Tanganda Estates has been a severe setback. This estate has played an important role in the development of this area.

Water from the Ngesi Dam is available to farmers and several are using this water for stockfeeds and other crops.

f. Irrigated Crops

Lucerne continues to be one of the most popular crops for the new schemes. Good yields are being obtained with the result that the cost of protein produced by lucerne is very cheap.

The new varieties of wheat are proving to be most promising and very good results were obtained this year.

Supplementary irrigation of maize has again proved to be very economical. Good rains over most of the country have reduced the number of irrigations required.

g. Sabi Valley Development Farm

A balance sheet was drawn up covering an 18-month period ending 30th September 1960. This is the first complete record of the present lessee's farming activities on the Development Farm and from it it was possible to determine the costs of production of the various crops. Cotton, potatoes and lucerne proved to be very economical but a great deal of money was lost on pea- and bean-seed production.

During the past year 72 acres of cotton were planted. This acreage was more than the lessee could comfortably handle, with the result that the grades suffered. Prices for this crop were lower than the previous year and the profit from cotton was greatly reduced. A further 28 acres of lucerne were planted during the winter and 37 acres of beans were grown for seed. Small acreages of potatoes and onions yielded well and good prices were obtained.

Sheep continue to thrive but much more information is required about management and the feeding of lucerne.

The past year was a reasonable one but the difficulties of farming an isolated farm of this nature are considerable.

C. SOUTHERN RHODESIA

(1) **Organization**

a. Head Office

As the Southern Rhodesian Headquarters are merged with the Federal Headquarters the matters dealt with under Item A.(1) "General" apply here also where Southern Rhodesia is concerned.

b. Regional Offices

The posts of Clerical Officers at the four Regional Offices were up-graded during the year with the result that three of the Regions had changes in their personnel.

c. Intensive Conservation Areas

The position in regard to Intensive Conservation Areas can be summarized as follows:

(i) Declared during the year as a result of subdivision of existing areas: Centenary West, Barwick and Chinyika.

(ii) Investigated or under investigation for declaration: Nil.

(iii) Subdivided during the year: Darwin and Umvukwes to form Centenary West, Umvukwes and Marodzi–Tatagura; Gwebi–Hunyani and Banket to form Barwick; Inyanga, Headlands and Rusape to form Chinyika.

(iv) Investigated or under investigation for subdivision: Nil.

(v) Boundaries changed: Gwanda, Limpopo, Nuanetsi–Mtilikwe, Glendale, Marodzi–Tatagura, Upper Ngesi, Shangani, Selukwe and Tokwe.

(vi) Investigated or under investigation for boundary changes: Banket and Trelawney — a portion of Trelawney to be added to Banket and Eldorado for consolidation into a Banket-Eldorado I.C.A.

(vii) The total number of I.C.A.s in Southern Rhodesia is 100.

The first steps towards the dividing of Mashonaland into two Regions have been taken by the appointment of a second Additional Regional Conservation and Extension Officer and the regrouping of I.C.A.s.

The full details of Groups and I.C.A.s are given in Appendix II A.

d. I.C.A. Committees

Committees have in general maintained their interest in conservation with an increase in their enthusiasm to improve the standards of farming in their districts. This was well displayed in the Natural Resources Board's competition for conservation farming.

The ward system has been adopted by the majority of I.C.A.s and developed to great advantage by many.

It is particularly gratifying to note the assistance that is being given by a number of committees to African I.C.A.s and farmers in adjacent Native Purchase Areas. Mchingwe I.C.A. must be selected for special comment for its excellent work in improving the standard of cultivation and land-use of the African tenants.

The Committees have played an important part in the programme planning of their areas and this has, in many instances, increased their activities.

e. Group Organization

As stated last year the ever-increasing number of I.C.A. Committees shows the importance of the Group Organization as a co-ordinating and stimulating body; there is a great need for the Group chairmen to meet regularly in order to effect national co-ordination.

f. Representation on Committees

In addition to the Southern Rhodesian Committees mentioned in A (2), officials also served on the following: Ministry's Show Exhibit Committee, Regional Water Development Committee, Sabi Catchment Protection Committee, Ministry's Dairy Recording Committee, various Show Committees, Experiment Farms' Liaison Committees, Young Farmers' Club Organization, Umtali Museum Society, Umshandige Irrigation Advisory Committee, Que Que District Irrigation Advisory Committee and Education Committees.

(2) **Transport**

Again it can be reported that the transport situation remained completely adequate during the year, proving that the current practice of allowing officers to use their private cars on official duty is a sound one. The assistance by means of loans is proving very satisfactory and is greatly appreciated by the officers. Details of the vehicle position in Southern Rhodesia is as follows:

	Regions	*Fed. & S.R. H.Q.*	*Total*
Private cars	126	31	157
C.M.E.D. cars and light trucks .	10	7	17
Outstanding loans . . .	7	—	7

(3) **Staff**

Numerous resignations during the year and the call up of a number of officers for the four-and-a-half months' military training, have inevitably resulted in a number of areas being without the services of field staff and the I.C.A. committees concerned are thanked for their forbearance during these difficult periods. Every effort was made to reduce to a minimum the inconvenience that farmers were caused by this staff shortage.

(4) **General Agricultural, Crop and Livestock Conditions**

Due to the widely varying conditions that obtained in the country during the year, reports by the four Regional Conservation and Extension Officers are being presented separately below:

a. Mashonaland Region

Climate

After sporadic but often heavy mid-October rain, general planting rains came after the middle of November. Thereafter distribution of rain was extremely regular in all but a few isolated areas, noticeably in the north-east of Karoi North I.C.A. and the north-west section of Glendale I.C.A.

Late rains were widespread during April; total falls of up to three inches during this month were general. The season, in all but those few isolated areas mentioned, was above average with near ideal distribution over much of the Region.

Hail was experienced in many areas but damage was not above normal. Winds were average in strength and few damaging wind storms were recorded.

Temperatures were not exceptional and little frost occurred.

(i) FOOD CROPS

(1) *Maize*

This year was a most favourable season for the production of grain resulting in very satisfactory yields estimated to average approximately 17 bags per acre over the Region. Despite a rather dry February and March in certain parts of the Mazoe Valley, the yields there were high.

The trends are to apply more fertilizer, particularly before planting time, and to grow three or four successive maize crops before resting the soil. These have had a beneficial effect in permitting better land preparation.

The widespread use of hand planting in holes prepared during the winter has made a big contribution to this year's high yields where early rains were scanty. The season permitted more efficient weed control which of course contributed to the higher yields. Individual heavy soil lands were recorded as yielding over 50 bags per acre, whilst some sandveld fields yielded over 35 bags per acre.

Low pH in heavy soils is an increasing problem in the older areas and this year has seen a very large increase in the application of lime by farmers.

The incidence of disease and pests was very low.

The late rains delayed the drying-out of the crop in the lands and, on many farms, reaping continued till the end of September, affecting land preparation for the coming season.

(2) *Sorghums*

Considerable interest has been shown in sorghum production for grain and silage production. Results have been disappointing, with low grain yields due to pest attacks — principally aphids and birds.

Mashonaland, climatically, appears better suited to maize than sorghum production.

(3) *Groundnuts*

Groundnut production increased in the Region largely as a result of the groundnut drive. Results have been encouraging and good yields have been achieved. The largest problem facing further development is that associated with harvesting. Until machinery is available for harvesting, large-scale production will be hampered by the high costs of handling this crop.

The late rains led to a considerable loss from sprouting.

(4) *Other Legumes*

The season was marked by a steady increase in the acreage of jack-bean grown as a green crop. Also gaining in popularity is *Crotalaria ochroleuca,* used as a green crop as well as a legume hay.

The interest in soya-beans is increasing steadily and several farms plant a small acreage each year. The value of using an effcient *Rhyzobium* inoculant has been demonstrated in trials and this is probably the key to the general adoption of this crop. The principal uses are for hay and grain as protein supplements in cattle rations.

Success in continuous maize cropping has reduced the use of sunnhemp and velvet-beans as green crops on lands high in fertility.

(5) *Potatoes*

This year the potato crop has been a good one, though damage to the early irrigated crop from blight was widespread. Summer potato production, using blight-resistant varieties which are sprayed to protect them from various pests, is increasing in popularity. A significant feature of the irrigated crop generally is that farmers at lower altitudes, where the frost risk is less, are increasing their production.

(6) *Wheat*

Though little increase in production has yet occurred, winter wheat is claiming more attention. The production of summer wheat continues in the Beatrice area, with very poor results.

(7) *Vegetables*

The peri-urban and urban areas continue to supply the bulk of the vegetables consumed in Salisbury.

(8) *Fruit (Sub-tropical)*

The largest increase in this field has come from the expansion of the Mazoe Citrus Estate.

Other sub-tropical fruit production is not expanding, though there is interest in long-term mango development. Grapes are becoming popular in peri-urban areas.

(ii) CASH CROPS

(1) *Tobacco*

This crop has already been dealt with at length under Section B.(3). Details, in consequence, will not be repeated here.

(2) *Cotton*

This year has seen a revival in cotton production in the Glendale and Bindura I.C.A.s. Yields, with regular spraying, have reached 2,000 lb. of seed-cotton to the acre. Every effort is being made to expand production.

(3) *Seed Production*

Steady progress in seed production is taking place and results are encouraging. This crop is tending to increase in importance on individual farms and in the long term a few large-scale specialist producers are likely to provide the bulk of production. This seems a sound approach. Vegetable- and flower-seed production, on the other hand, seems ideally suited for small farm irrigation schemes; more and more farmers in this category are interesting themselves in this line of production.

Tobacco-seed production has expanded to the point where requirements are being met.

(iii) FODDER CROPS

Maize remains the chief fodder crop and its use for cattle feed is expanding.

Supplementary protein crops, such as jack-bean, soya-bean, sunflowers, crotolaria, velvet-beans, cow-peas, dolichos-beans and sunnhemp, are being expanded in consequence of increased winter feeding. In spite of cases of poisoning from over feeding jack-bean, the use of this crop has grown rapidly.

Afforestation

Planting of eucalyptus and conifers for farm use continues. Further commercial production is being planned in the Umvukwes and Marandellas areas.

Livestock

(i) BEEF CATTLE

Mashonaland has experienced two reasonable seasons in succession for livestock and this has been reflected in an increased volume and standard of beef production. Special attention has been paid to the management of drought relief cattle given to farmers on a Cold Storage Commission agreement, and these cattle have, with only a very few exceptions, done well.

The growing interest in beef cattle fostered by the beef drive has important implications for Mashonaland, where the potential for this line of production is very great. The drive itself has led to material progress being made in the standard of cattle husbandry. Winter supplementation of young stock and cows is no longer a rarity and in some areas is a general practice. This is being reflected in better calving percentages and younger age at slaughter.

A noticeable development during the winter of 1961 was the increase in pen-fattening of steers. Though scarcity of suitable feeders brought about a marked increase in the cost of this class of animal, results have been satisfactory in terms of profitability, especially in the maize producing areas.

The large demand for feeder cattle in the maize areas of Mashonaland has undoubtedly sparked off a greater interest in breeding animals suitable for pen feeding, and this has been reflected in an increase in the demand for good, well-grown weaners and bulls of the Aberdeen-Angus, Hereford, Sussex and, to a lesser degree, the Shorthorn breeds.

Noticeable developments have been the establishment of special auction sales of cattle at Marandellas and at the Bindura Country Fair, and several bull sales on farms and at local auction markets. There is an increased interest amongst bull breeders in performance testing.

(ii) DAIRY CATTLE

Though the steady expansion of milk production in recent years has ceased, there has been no material reduction in the volume of milk production in the Region.

The most important item of cost which the farmer can control in the short term is undoubtedly the cost of feed. Home-grown roughages can make a larger contribution than they do at present and farm-grown concentrates can be fed to the many low-producing cows at present in herds without fear of loss of production. In the long term, rigorous culling and better rearing methods for heifers can bring greater efficiency.

The use of beef bulls on low producers is gaining in popularity where farms have the available grazing to rear beef stock.

(iii) SHEEP

Mutton and lamb production continues to expand throughout the Region but more progress is being made in tobacco areas than in the maize areas. The Blackhead Persian is giving way to the Dorper, Wiltiper, German Merino and van Rooyen breeds, with a consequent increase in the percentage of lamb carcasses being produced. The scope, especially in lamb production, is still immense and a further increase in this commodity is anticipated.

Winter supplementary feeding is undoubtedly the weakest link in sheep management and many of the severe parasite problems encountered by flock owners would become very much more tractable if better winter supplementation were provided.

(iv) POULTRY

Poultry production is mainly in the hands of a few large specialists near Salisbury and plot-holders in Salisbury. Turkey production last year seemed to be capable of satisfying local demand.

(v) FISH

There has been no increase in intensive fish production from special ponds. Farmers continue to stock their dams mainly with *Tilapia* and some bass. Use of fish from dams is general, but most are caught by rod and line rather than by netting.

b. MATABELELAND REGION

Climate

In contrast to the previous year, the past season was one of the most favourable on record. Rainfall was above average in most areas and well distributed during the period October–April, with isolated showers occurring into July.

Grass growth has been excellent and, with few exceptions, grazing has recovered from the previous drought. In spite of the good rains, however, run-off in the eastern watershed area was very low and comparatively few dams filled, but generally water supplies have been satisfactory.

The wet season was followed by a relatively mild winter, with very light frosts, but was characterized by long periods of overcast weather.

Crop Production

(i) FOOD CROPS

(1) *Maize*

Matabeleland produced one of the best maize crops in its history. Excellent yields were obtained where principles of good husbandry were followed. Average yields varied from 12 bags per acre on poor sandveld to 15–20 bags per acre on better dryland soils, while irrigated yields went up as high as 38 bags per acre.

The total maize crop was increased as a result of farmers obtaining their silage requirements from relatively small acreages and allowing the remainder to grow out for grain.

Maize retained the position as the most popular grain and fodder crop in the Region, a position which no doubt will be strengthened as a result of the past season.

(2) *Sorghum*

There was a small increase in the acreage grown for grain. The main variety was Red Swazi, which appears to be well adapted to the heavy black soils in western Matabeleland. Small trials of the K.2 Red varieties, Radar and Barnards Red, yielded 12 to 14 bags per acre on red soil in the Shangani area; indications

are that even higher yields could have been obtained with optimum plant populations and improved levels of management. These trials have encouraged farmers to increase plantings of this crop during the next season.

Sorghums continue to gain in favour as a silage crop, the more popular varieties being Haakdoorn and Sugar Drip. Excellent yields of up to 14 tons per acre were obtained on heavy soils.

(3) *Groundnuts*

It is regrettable that this crop is still limited to relatively small acreages, grown mainly for fodder purposes and for Native rations. The greatest acreage was grown on the Kalahari Basalt contact soils in the Lower Umgusa/Khami area, and yielded very well. This area is well suited to groundnuts and it is expected that an increased acreage will be planted next season.

Mechanization problems will limit increased grain production in the Region, but as a result of propaganda and field visits by specialists, a considerable increase in plantings for rations and livestock feed is expected. Once farmers gain experience in growing the crop it is possible that they may become interested in growing larger commercial acreages and invest in picking and shelling equipment.

(4) *Potatoes*

Potato cultivation is confined to irrigated spring, autumn and winter crops. The spring crop acreage was below normal, due to lack of irrigation water following the drought, but there has been an increase in the winter crops, particularly in the Limpopo and Umzingwane valleys. Two hundred acres of winter potatoes were grown in the area and yielded up to 100 bags per acre. These are realizing a very high price, due to the current shortage.

The Limpopo and Umzingwane valleys, being comparatively frost free, are ideal for the production of the winter crop.

(5) *Wheat*

The acreage remains at approximately 250, one-third of which is on the Municipal Sewage Farm.

(6) *Vegetables*

Production is largely in the hands of smallholders around Bulawayo and of farmers in the vicinity of the smaller centres.

Large-scale production is increasing on irrigation schemes in the Limpopo area, and there has also been an increase in production in the Gwaai–Matetsi area for the Wankie market.

(7) *Fruit*

There has been a slight increase in production, but the acreage under orchards is still very limited. Citrus is the only type marketed in any quantity.

Commercial orchards probably do not total over 200 acres in Matabeleland.

(ii) CASH CROPS

(1) *Tobacco*

This crop has been dealt with at length under Section B.(3). Details, in consequence, will not be repeated here.

(2) *Cotton*

A very limited acreage was grown with fair results. With the new varieties, improved production methods and pest control, there could be a renewed interest in this crop. Twenty-five acres are being grown as a trial under irrigation in the Limpopo lowveld and, if successful, may lead to a much greater acreage being planted by several farmers during the following season.

(iii) FODDER CROPS

Reasonable progress has been made in encouraging farmers to change their approach to the place and function of arable farming in their enterprises. There is a growing appreciation among farmers that arable farming is designed mainly to supplement the natural veld as a source of feed during winter and that cropping could exercise a stabilizing effect on their overall farming operations which, in the long run, are inevitably subsidized by their livestock enterprise. There is great scope for better integration of livestock and arable farming in the Region.

Fodder crop yields over the Region during the year have been excellent. Large quantities of fodder have been preserved in the form of silage. Due to the excep-

tionally good yields, provision has been made on many farms for additional silage storage facilities. Maize and sorghum remained the most popular silage crops — particularly sorghum on the heavier soil types. Velvet-beans and cow-peas continued to be the most popular legume crops. Results with sunnhemp have been disappointing, due to very rank growth and the quality of the hay. This crop holds good promise, lending itself to mechanization and quick curing. Large quantities of hay were lost or spoilt during the curing process, due to the extended rainy season experienced. Lucerne and winter cereals are the most prominent fodder crops under irrigation. Due to the high water requirements and indifferent yields of hay, there has been a waning of interest in pastures.

Annual crops hold very good prospects of yielding the highest amount of nutrients and bulk per unit of water used, especially under conditions where permanent water supplies and land are comparatively unlimited.

In view of the variation in quality of roughages, farmers have been encouraged to have these feeds analysed. A knowledge of the analysis of roughages ensures correct feeding and more economical production.

Livestock

The year under review has been good from the livestock production aspect. The distribution of the rains was excellent and the season, in consequence, was abnormally long. Summer performance of stock has been good.

The outbreak and the regular periodic spread of foot and mouth disease since last year has severely hampered and disrupted the general management of stock. The marketing of slaughter stock presented many difficulties and many bookings have been cancelled, resulting in hardship to the farmers concerned. Summer gains were very materially reduced, due to concentration and disturbance of stock for extended periods. Farmers in the Plumtree, Marula, South Matopos and Gwanda I.C.A.s have been seriously affected.

(i) BEEF CATTLE

In general, good progress has been made in better stock management, as evidenced by—

(a) the increase in winter supplementary feeding of different classes of livestock that has taken place;

(b) the fact that weaning and controlled breeding seasons are more generally practised;

(c) the increase in interest in systematic recording and identification marking of stock that has occurred;

(d) the fact that cattle handling facilities have improved. Beef discussion meetings and field days have contributed towards improving methods of livestock production.

Calving percentages have been below average, which can be attributed to the drought experienced last year. Calving percentages can be increased by practising better methods of veld utilization (in particular, during the growing season), discriminate winter supplementary feeding, selection based on records and the introduction of constructive methods of culling.

Although steady progress has been maintained, great scope exists for increased efficiency in production methods. Much remains to be done to exploit the potential for increased production.

(ii) DAIRY CATTLE

Due to the good cropping season, ample supplies of roughage have been produced, resulting in a good year for dairy farmers. Dairy stock are generally in good condition.

There is room for improvement in general management and in increased efficiency of production, particularly in regard to the need for—

(a) a better balance between stock numbers and produced roughages;

(b) constructive culling and selection based on production records;

(c) a greater degree of selectivity in the progeny that are kept and reared for herd replacements;

(d) keeping regular records covering all aspects of production and their regular analysis;

(e) the improved management of young stock;

(f) greater care in the composition of concentrate rations.

(iii) SHEEP

Flocks have performed well this year. There appears to be a greater interest in sheep, particularly among dairymen looking for side-lines. In the majority of cases, production is off the veld. There is little intensification of production. The Blackhead Persian constitutes by far the major type in flocks. Management, generally, can be improved. Conditions are suitable for the running of small flocks on most of the farms in the Region. Under good management, sheep could provide a very useful additional source of income on most farms in Matabeleland. Mutton production deserves more attention and should be stimulated.

(iv) GOATS

No increase in interest in goats is reported. Most of the goat population is owned by African tenants who use the animals mainly for domestic consumption.

(v) PIGS

Pig production is still at a low ebb, a fact due largely to the low margin of profit experienced by producers, who are unable to grow the grain portion of the necessary concentrate ration. There are only limited numbers of producers whose income from pigs represents a reasonable percentage of their annual income. The general standard of management is satisfactory.

(vi) POULTRY

Poultry are kept mainly to satisfy domestic requirements. Several farmers keep poultry as a side-line, with variable management standards. There are about twenty producers in the Region who do poultry on a commercial scale. The battery system is gaining in popularity.

(vii) FISH

Many farmers have endeavoured to restock their dams following last year's drought. Several farmers in the Shangani Group in particular are showing interest in exploiting fish in dams by gill and seine netting. With the co-operation of the Chief Fisheries Officer, it is intended to establish a centre on a farm near Shangani where farmers can obtain fingerlings for stocking purposes.

There is considerable scope for the increased production of freshwater fish, a valuable source of protein for farm labourers. Intensification of propaganda and advice to farmers on the development and utilization of this type of production are warranted.

c. MIDLANDS REGION

Climate

In contrast to the 1959–60 cropping season, climatic conditions during the 1960–61 season were generally very satisfactory for both livestock and crop production.

Total rainfall was, by and large, average, with good early and late rains occurring in all areas; distribution of rainfall generally was also good. Exceptions to these general observations occurred in a small area in the west of the Umfuli South Group, where a January to February drought was experienced and, to some extent, in the Victoria Group, where a dry March reduced crop yields. While, on the whole, there was sufficient rain for most crops in the Charter Group, it appeared that during the growing season many tobacco crops in the Group were under slight moisture stress on several occasions during the drought periods of 1–3 weeks.

Crop Production

(i) FOOD CROPS

(1) *Maize*

The Midlands Region has had one of the largest maize crops for many years, with yields as high as 33 bags per acre. Excellent results are reported from the H12 Hybrid.

The standard of cultural practices and field management was of a high order and there has been an increase in the use of nitrogenous fertilizers applied to stover at time of ploughing.

(2) *Sorghum*

The increase in the acreage of sorghums during the last season has been substantial — over 2,500 acres being grown in the Gwelo Group alone. Over 2,000 acres and over 1,000 acres were produced in the Que Que and Victoria Groups, respectively. A great increase in production of this crop also occurred in the Umfuli South Group.

Most crops were of the varieties which could qualify for the "S" grade.

Yields varied considerably, with estimates ranging from 5–10 bags per acre. The reason for the lower yields are variously given as inadequate fertilization, low plant population, poor drainage, late planting, growing of the crop on sands, and the fact that on many farms the crop was not given the attention and priority it merited. Sorghum on many properties was, therefore, the Cinderella crop, taking second place to other crops, particularly maize, where fertilizer applications and time of planting were concerned. There is, however, little doubt that with the present maize price trend, and with improved management, sorghum production is not likely to decline.

(3) *Groundnuts*

The propaganda drive, carried out by officers of the Department to boost groundnut production, met with only partial success. The main areas of production were in the Gwelo and Victoria Groups, where some 350 acres and 750 acres, respectively, were grown. Much of the Gwelo production is localized on the sands in the west of the Group. It is a highly desirable development, as groundnuts represent the only cash crop which can be recommended for the area.

Yields varied from 3–11 bags of shelled nuts per acre.

Many of the problems of groundnut production have been overcome by farmers and greatly improved yields can be expected. A picker-sheller has been purchased by one grower and will be used co-operatively.

(4) *Potatoes*

The acreage planted to potatoes is believed to be greater than in the previous year, a development that is particularly true of the Umfuli South Group. Yields are generally described as being fair to good in the case of both dry-land and irrigated crops, ranging from 40 to 180 bags per acre.

(5) *Wheat*

A small increase in the acreage of wheat grown under irrigation is reported from the Umfuli South Group. Elsewhere in the Region small acreages are grown and yields are expected to be good.

The optimism expressed in the last Annual Report regarding the anticipated success of a wheat trial on moisture-retaining sands in the Enkeldoorn Group was justified.

(6) *Vegetables*

As a result of the lack of organized marketing facilities, the production of vegetables varies considerably from year to year, the larger producers generally supplying the needs of industrial and mining concerns and Government institutions. Much of the production comes from small units in the environs of the towns.

(7) *Fruit (Deciduous)*

Some revival of interest in fruit production is reported.

(8) *Fruit (Sub-tropical)*

A slight expansion in the acreage of citrus is reported. The first crop of any substantial quantity has been harvested in the Victoria Group lowveld and is stated to be of excellent quality. Should the venture continue to be successful, citrus production should increase considerably in the lowveld.

(ii) CASH CROPS

(1) *Tobacco*

Details regarding this crop have been dealt with at length under Section B.(3).

(2) *Cotton*

Cotton production during the past season was largely confined to the Victoria lowveld area; a few crops were grown in the Victoria highveld and the Que Que and Umfuli Groups. In the latter area the anticipated increase in acreage did not materialize. In the Umfuli South Group the benefits of a planned spraying programme, combined with early dry-land planting, or late planting, combined with supplementary irrigation, were very clearly demonstrated. In the former case, yields of over 2,000 lb. per acre were reported while, in the latter case, yields were of the order of 1,800–2,000 lb. per acre.

A total of approximately 1,100 acres of dry-land cotton was grown in the Victoria Group, of which 1,050 acres were established in the lowveld. In addition, 530 acres were established under irrigation, of which 510 acres were in the Sabi Valley. The lowveld dry-land crop did remarkably well, yields exceeding 1,200 lb. per acre. Spraying of the dry-land crop was, however, not quite adequate, causing

a build-up of the Red and American Boll-worm, which affected yields. Helicopter spraying was resorted to by some growers.

The irrigated crop responded exceptionally well and average yields were the highest ever achieved in the Region—2,800 lb. per acre from 75 acres, and 2,500 lb. per acre from 400 acres. It is indeed disappointing to report that one large estate, which produced over 1,000,000 lb. of seed-cotton this past season, has abandoned the crop.

(3) *Sugar-Cane*

A substantial expansion in the acreage planted to sugar-cane has again taken place on the Triangle Sugar Estates, the Hippo Valley Estates and on the settlers' farms. Some 15,000 acres are now established to cane, with development proceeding apace. New sugar-mills are in the process of being constructed on both estates.

Kyle Dam water is now available to the lowveld and, when reinforced with Bangala Dam water, should ensure further development of the crop in this general area.

Interest in the production of sugar-cane for local consumption is reported in the Umfuli North Group.

(4) *Legumes*

Some excellent cow-pea, sunnhemp and velvet-bean hay crops were grown during the season, only to be spoilt by late rains. The fact that such good crops can be grown only to be spoiled by the weather has caused many farmers to consider purchasing forage harvesting equipment. A number of machines have, in fact, already been bought.

Vine rot in velvet-beans caused concern in some localities.

The only irrigated legume of any consequence in the Region is lucerne, which is receiving increased attention. Considerable expansion is reported in the Que Que Group, where 170 acres are now established.

(5) *Seed Production*

A marked increase in interest in seed production is reported from the Que Que Group, where the area down to peas and beans for seed production now exceeds 100 acres. Indications are that good yields will be achieved. Elsewhere in the Region small plantings have taken place; most of these are concentrated in the lowveld.

(iii) FODDER CROPS

Mainly as a result of the beef production drive, it can be stated that there has been an increase in the acreage planted to annual fodder crops; the quantity of fodder produced is small compared with that which is required, however.

Through demonstration of the recommended forage sorghum varieties, it is hoped that sorghums will play a rather more important part in fodder production than they do at present. Interest, too, is being stimulated in soya-beans, while a promotion campaign for dhal production continues with some results. The increase in the acreage planted to oats for fodder on vlei-land in the Kalahari sand area is expected to continue.

Some apprehension is expressed in the north and south-east of the Region regarding the incidence of vine-rot in velvet bean which, together with cow-peas and sunnhemp, is the most important legume crop. Jack-bean, grown on a limited scale, is producing good results.

(iv) PLANTED PASTURES

Love grass pastures and, to a lesser extent, Katambora Rhodes, continue to be incorporated in the tobacco rotation at a very significant rate.

Napier fodder is slowly disappearing from the scene, as it is a difficult crop to handle with standard silage equipment and the end-product is not of high quality or palatability. Some difficulty has again been experienced by growers in establishing grass leys, much of the problem being tied up with the fact that few rollers exist on farms. It is becoming a fairly common practice to follow tobacco with maize planted in 7-ft. rows and to undersow with grass at the last cultivation of the maize crop. In nearly all cases, grass leys (particularly in the tobacco rotation) received no fertilizer, yet good use is being made of the grass for stock feed.

On certain dairy farms, the need for summer pastures has become obvious and interest shown by dairymen in this problem will more than likely result in an increase in pasture establishment on their properties.

Afforestation

Other than the small acreages of trees, usually *Eucalyptus* spp., planted on many farms each year, there has been no large-scale afforestation scheme, with the possible exception of the effort at Selukwe.

One committee in the Charter Group once again operated its tree nursery successfully — this is active encouragement for local farmers to plant trees for shelter and timber production.

Livestock

(i) BEEF CATTLE

The past year has been a good one for livestock; a well-balanced rainy season, together with late rains, ensuring an adequacy of grass and water on most holdings. The calf crop has varied considerably. The lower calving rates are largely attributable to the effects of the 1959-60 drought, coupled with the inadequacy of winter supplementation. Cattle made good weight gains during the summer, particularly when maintained during the 1960 winter.

The late rains and little frost influenced the degree of winter supplementation in certain localities where, during a cold and windy August, cattle lost condition rapidly.

Cattle numbers are now building up rapidly on the newer ranches and stocking rates in relation to existing developments are being carefully watched. In certain of the tobacco areas, farmers are aware of the need to introduce the livestock factor into their general agricultural set-up.

(1) *Feeding*

The expansion of feeding programmes reported upon last year continues. The use of purchased and home-made urea-salt-molasses mixtures has increased tremendously and most farmers are highly satisfied with the results.

Concentrate mixtures of velvet-bean, pod-meal and maize-meal, as well as whole cotton-seed when obtainable, are being used to fatten steers. There has been a definite increase in yearling supplementation this year, the aim being to sell them as feeders at 2½ years of age. Some feeders, however, have had disappointing results with the younger animals and are reverting to the four-year-old steer. Maintenance winter feeding of 3½-year-old steers, combined with supplementary feeding of maize on summer grass for slaughter in summer, proved very profitable.

The number of scales in the Region is slowly increasing.

(2) *Management*

A conspicuous improvement in the overall standard of management is noted and handling facilities on many farms are improving.

An increase in pregnancy testing, to sort out the cows requiring the best grazing, feed and attention, is reported.

Vermin, chiefly leopard and wild dogs, continue to be troublesome on many holdings, making it necessary to kraal cows at night during the calving season.

(3) *Breeding*

While breeding policies in the main have been directed towards grading up with indigenous bulls, the tendency to introduce exotic blood, mentioned in the last Annual Report, continues for the purpose of producing cross-bred weaners and feeders.

A small herd of Angoni cattle, introduced to the Region from Northern Rhodesia, has settled down extremely well.

The policy of evolving a three-eighths exotic indigenous type is continuing on certain large estates in the Charter Group. Performance testing is a new development taking place in the Charter area.

(ii) DAIRY CATTLE

During the year there has been a steady increase in the quantity of milk produced and large amounts surplus to requirements have been used for industrial purposes.

In many cases, feeding is quite inadequate. Lack of recording and feeding according to production is a weakness on many dairy farms, as is also the lack of knowledge of how to balance rations. Officers are doing their best to remedy these shortcomings by personal visits and through the medium of dairy discussion groups.

(iii) SHEEP

The Region can support a great many more sheep, particularly on the smaller properties. The use of rams, such as Dorper, Wiltiper and van Rooyen, is spreading. These animals, when crossed with Black Head Persian ewes, give mutton carcasses which butchers prefer.

(iv) PIGS

The main pig production centres of the Midlands are the Umfuli and Victoria Groups, where production has remained static. The question of centralized slaughtering in Salisbury continues to cause great concern to pig producers in the Victoria area.

(v) POULTRY

There has been a slight increase in commercial and broiler production, much of the output being from small flocks.

(vi) FISH FARMING

Several sets of fish-ponds were constructed during the year. Results of the netting of ponds have been disappointing when compared with those achieved by the Department of Research and Specialist Services at the Henderson Research Station. This fact may be due to faulty management on the part of the farmers concerned and, possibly, to unreliable water supplies.

d. Eastern Region

Climate

The chief factor, rainfall, has been responsible for one of the best distribution records in the last 15 years. Starting in mid-October with good planting rains over most of the Region, the pattern continued well into autumn with evenly spaced effective showers of rain that fell almost exactly when they were wanted. In the high-rainfall areas of the Eastern Group, winter rains were also well above average and continued as effective falls right through to the end of September.

It was interesting to note that the hours of sunshine were considerably less in 1960–61 than in previous years.

Crop Production

(i) FOOD CROPS

(1) *Maize*

The season was almost perfect for maize production, particularly for those well-organized farmers who were able to take advantage of the October planting rains. All Groups have reported yields well above average, a result due primarily to the good rainfall distribution during the season, but also to a definite improvement that has taken place in cultural practices — particularly in high stand percentages and improved fertilizer applications.

More maize is being utilized for cattle feeding than previously.

(2) *Potatoes*

In spite of late and early blight, Walenga and Up-to-Date varieties produced a good summer crop of both ware and seed. Of the crops grown, 15 to 20 per cent. produced average yields of over 150 bags per acre each. Potatoes are being grown over a wider area in the Region than hitherto.

(3) *Groundnuts*

The oil-expressing plant in Rusape, plus experimental trials and encouragement given by the Department in that Group, have accounted for approximately 400 acres being grown.

Best yields have been following tobacco, which appears a safe and practical way to make use of the residual fertilizer left over by this particular crop.

(4) *Beans, Sorghums and Sunflowers*

Dried beans are mainly grown as rations for African labourers, and summer annual legumes, such as velvet-beans and cow-peas, are popular late-season grazing crops used to supplement the declining veld and summer pasture grazing.

(5) *Dhal*

By a process of elimination with field trials, dhal varieties most suited to the particular climatic and soil conditions of the Eastern Region are being investigated.

(ii) CASH CROPS

(1) *Tobacco*

Details regarding this crop have been given under Section B.(2) and will not be repeated here.

(2) *Fibre*

The high-quality New Zealand flax (*Phormium tenax*) is to be tried out in the mist-belt areas.

(3) *Sugar-cane*

This crop is being tried out in the Chipinga I.C.A. on some 250 acres.

(iii) FODDER CROPS

(1) *Lucerne*

Acreages of lucerne continue to expand steadily, particularly as seed and inoculant become more available and reliable.

As a protein supplement at reliable costings of 3½d. per lb. crude protein, lucerne will go a long way to help balance up the natural veld grazing for the expanding beef herds in this Region.

(2) *Winter Cereals*

Oats and barley have increased in popularity with the decline in interest in irrigated pastures. Following very promising results from oats and hairy vetch grown at the Chipinga Experiment Farm some years ago, dairy farmers in the Umtali area have extended their winter feeding into September with six separate grazing periods. The vetch takes over from the oats when the latter pipes at the onset of the hot weather.

(3) *Kale*

Each year more of this very useful fodder crop is grown — particularly by dairy farmers. Yields of up to 25 tons per acre have been estimated; the crop is well adapted to winter conditions and can be established before the end of the summer rains as an inexpensive supplement to the declining grazing.

(iv) FRUIT AND VEGETABLES

(1) *Deciduous Fruit*

Plantings during the season consisted mainly of apples and peaches. The majority of orchards were established according to Horticultural Officers' recommendations.

Apples. Varieties: A complete range of commercial apple varieties is now available for the season. Two early varieties, namely, Early McIntosh and Canvada, have filled in a very important gap. On an irrigated orchard in Melsetter, 14-year-old Rome Beauty trees averaged 8 bushels per tree. Many of the trees yielded up to 10 bushels.

Cider Apples: At Inyanga, a commercial planting of cider apples was established by private enterprise. Two independent inquiries have been received from overseas firms on the possibility of establishing cider factories in Umtali.

Diseases: The research work carried out by the resident Plant Pathologist has been most productive and growers who efficiently carried out recommendations have obtained satisfactory control.

Pests: The fruit-piercing moth remains one of the major pests of apples and peaches. In the case of apples, this pest may prove a limiting factor in efficient storage.

Storage: Trials carried out in Umtali with apple varieties in cold storage indicated that Granny Smith without doubt was an excellent storing variety. White Winter Pearmain was picked too ripe and became mealy at an early stage. Versfeld stored very well for a period of three months.

The highest percentage of loss in storage was due to damage caused by fruit-piercing moth.

Peaches. The varieties Culemborg, Swellengrebel and Boland continue to crop well and are very well received on the fresh markets. Every effort is being made to develop an export market for dessert peaches.

From the Californian peach and nectarine varieties, very valuable material has been selected. The two nectarine varieties, Silver Lode and Pannamint, have cropped regularly for three seasons, giving fruit of excellent quality that is suitable for export. A wide distribution of the above-mentioned nectarine varieties has been effected to determine the results under varying climatic conditions and altitudes.

The Californian peaches have also been distributed and budded on to established trees for quick results.

Plums. The plum plantings are adequate to supply the demand during the six-week period of cropping, i.e. mid-November to the end of December.

No further plantings of plums have been recommended as this type of fruit is not in the luxury class and cannot be considered for export.

Pears. The plantings of pears have been most disappointing, a fact that is due mainly to the lack of experience in ripening. An excellent market exists for this fruit as a canned product.

Trials on cold storage ripening are envisaged during next season with pears from Rhodes Inyanga Orchards. The fruit will be harvested by using the pressure-testing method.

(2) *Citrus and Sub-tropical Fruit*

General. The production of citrus and sub-tropical fruit in the Eastern Districts is scattered and spasmodic. It is doubtful if this position will improve until a sound marketing system is evolved.

Citrus. The larger producer of citrus has had comparatively little difficulty in disposing of his crop, being in a position to give a continuous supply during the season. The smaller growers, on the contrary, have experienced much difficulty in disposing of their products. This position has brought about negotiations for co-operative marketing.

The production of citrus on the smaller farms is neither planned nor properly cared for. All future plantings should be established with the emphasis on quality which can only be brought about by using sweet orange stock.

Bananas. The production level of this crop has remained static over the past year. With negotiations for orderly marketing now in progress, it is reasonable to expect a renewal of interest in improved methods of growing and handling bananas. Particularly will this be true if a satisfactory conclusion to these negotiations is reached.

Avocadoes. Present plantings of avocadoes in the Eastern Districts will have a considerable impact on the market as soon as the trees are in full bearing.

Papaws. A considerable early season fresh market exists together with a potential market of up to 400 tons per annum for processing. The processing price of 1½d. per lb. gives a very high return per acre.

(3) *Vegetables:* (a) *Vegetables for Processing*

Cauliflowers. Of the 36 growers producing cauliflowers for processing, only four grew the contracted amount. The main reason for the poor yields of many crops was the low standard of seed-bed management. Four growers in Melsetter and Chipinga, who contracted to produce a total of 75 tons, failed to deliver any cauliflowers. Despite field days and regular visits to growers it has not been possible to bring about a good average standard of cauliflower production. Growers who have followed recommendations given by the horticulturists are convinced that this crop is the most profitable on irrigated lands.

It is estimated that at least 150 tons of cauliflowers grown for dehydration were diverted to the fresh market.

Brussels Sprouts. The three varieties, Long Island Improved, Cambridge Special and Irish Glacier were grown for processing. The variety Long Island Improved gave the highest yield, but Irish Glacier and Cambridge were more suited for deep freezing. From observations on times of planting it is now known that seed sown later than January does not result in an economic yield being achieved. Later plantings fail to develop into economic crops before going to seed.

Peas. The production of peas during this past season has been most disappointing. It is reasonable to surmise that the warm conditions during the winter brought about a reduction in yield. The introduction of grading regulations upset the normal crop management and growers were unable to get the labour necessary for the picking of less mature peas. With the present grading regulations it will be necessary to change back to the growing of the variety Greenfeast.

Beans. With the high incidence of seed-borne disease on imported bean seed, the Dehydration Factory has organized the production of local bean seed which is grown in areas and during seasons when seed-borne diseases do not occur. The seed is available to growers at a cost of not much more than half the price of imported seed.

Sweet Corn. Sweet corn has become a very popular crop in the Eastern Districts; yields of up to six tons per acre were obtained by individual growers last season.

Tomatoes. There has been a considerable increase in the production of tomatoes in the Umtali area, with a probably comparable decrease in production in the Cashel area. The increase in production for processing is probably the main reason for this development around Umtali.

It has proved very difficult to obtain fully plant-ripe tomatoes due to bird losses.

(b) *Fresh Market Production*

The introduction of a cold truck to Salisbury and Bulawayo has assisted appreciably in the development of a market for fresh vegetables from Umtali to such centres.

Livestock

(i) BEEF CATTLE

The demand for grazers, feeders and breeding stock is reflected in the considerable increase in sale transactions that is taking place, particularly in the tobacco areas. The beef industry is developing very satisfactorily in all four Groups and, at present, with a minimum of speculation.

A real break-through has been made in immunity inoculation and dosing for internal parasites due to the excellent co-operation of the Veterinary Department. Following closely on this reduction of internal parasites, the supplementary feeding of young stock with protein-rich cubes has increased tremendously.

(ii) DAIRY STOCK

The Dairy Economy Campaign directed at the milk producers made very little progress compared with the spectacular success of the campaign launched to help increase the sales of milk products to Africans.

The difficulty in disposing of dairy heifers has resulted in a campaign to use beef bulls in dairy herds on the lower producing cows. This would rule out the use of the progeny of these cows as dairy animals and limit the replacement heifers to 15 to 20 per cent. of the milk herd—all from the most efficient dams.

(iii) SHEEP

Although there is a steady build-up of flocks, particularly Blackhead Persians, the increase is not comparable to that which has taken place in beef herds.

The outstanding Corriedale sheep (11 ewes and 1 ram) imported from Australia by an Inyanga farmer will be used for stud purposes and will eventually raise the standard of dual purpose sheep on the highveld areas of Inyanga and Melsetter.

(iv) POULTRY

In the Umtali area there are a number of large breeders; no appreciable increase in the industry is envisaged.

(v) FISH

A further 18 acres of fish ponds are in commercial production and indications from sales and inquiries are that further expansion will take place.

(5) Livestock Improvement Scheme

The Department continues to operate this scheme. Four meetings of the Livestock Improvement Committee were held during the year, the number of applications dealt with being 173, involving 189 bulls, 34 females, 39 pigs and 18 sheep.

The new conditions of the scheme made the payments of grants much easier and once again all commitments were met.

PURCHASES OF STOCK BY THE COMMITTEE FOR FARMERS

	1.10.60 to 30.9.61	1.10.59 to 30.9.60	1.10.58 to 30.9.59
Pedigree bulls	12 for £2,260	1 for £262 10s.	4 for £744 15s.
Pedigree females	—	—	6 for £875
Grade females	—	14 for £808	67 for £3,777
TOTAL . . .	12 for £2,260	15 for £1,070 10s.	77 for £5,396 15s.

DETAILS OF BREEDS PURCHASED

	1.10.60 to 30.9.61	1.10.59 to 30.9.60	1.10.58 to 30.9.59
Bulls			
Africander	1 for £180	—	—
A. Angus	3 for £645	—	2 for £341
Friesland	1 for £400	1 for £262	2 for £403
Sussex	3 for £420	—	—
South Devon	2 for £300	—	—
Mashona	1 for £100	—	—
Shorthorn	1 for £215 10s.	—	—
TOTAL	12 for £2,260 10s.	1 for £262	4 for £744

	1.10.60 to 30.9.61	1.10.59 to 30.9.60	1.10.58 to 30.9.59
Females			
Pedigree females	—	—	6 for £875
Grade females	—	—	—
Friesland	—	14 for £808	63 for £3,657
Jersey	—	—	4 for £120
TOTAL	—	14 for £808	73 for £4,652

SHEEP PURCHASED

	1.10.60 to 30.9.61	1.10.59 to 30.9.60	1.10.58 to 30.9.59
German Merino	—	—	—
Rams	—	1 for £36	—
Dorper rams	11 for £165	29 for £453	36 for £528 15s.
Dorper rams	20 for £120	20 for £120	2 for £21
South Devon rams	1 for £40	—	—
TOTAL	32 for £325	50 for £609	38 for £549 15s.

IMPORTATION OF STOCK

1. Republic of South Africa

(a) Stock imported by the Committee and farmers combined, on Essentiality Certificates issued by this office, excluding imports on special permits granted by the Republic authorities:

	1.10.60 to 30.9.61	1.10.59 to 30.9.60	1.10.58 to 30.9.59
Pedigree Bulls			
Ayrshire	—	1	2
Friesland	8	18	21
Guernsey	—	—	2
Jersey	7	14	16
Aberdeen Angus	9	3	1
Africander	80	90	102
Hereford	5	2	9
Shorthorn	4	4	1
Sussex	26	1	6
South Devon	2	2	2
Red Poll	—	—	5
Brown Swiss	—	2	1
Brahman	1	—	—
Dexter	—	—	1
Siementhalar	—	2	1
North Devon	—	—	1
TOTAL	142	139	171

	1.10.60 to 30.9.61	1.10.59 to 30.9.60	1.10.58 to 30.9.59
Pedigree Females			
Friesland	4	45 plus 4 calves	47
Guernsey	—	—	9
Jersey	18	84	58 plus 3 calves
Africander	12	90 plus 4 calves	69 plus 14 calves
Sussex	15	—	—
Brown Swiss	—	9	—
Red Poll	—	12 plus 2 calves	6 plus 1 calf
Hereford	4 plus 2 calves	12 plus 2 calves	—
Dexter	—	—	7 plus 3 calves
Siementhalar	—	—	3 plus 1 calf
TOTAL	53 plus 2 calves	252 plus 12 calves	199 plus 22 calves

	1.10.60 to 30.9.61	1.10.59 to 30.9.60	1.10.58 to 30.9.59
Grade Females			
Friesland	—	370 plus 7 calves	465 plus 17 calves
Jersey	4	168 plus 6 calves	232 plus 6 calves
Dexter	—	—	7 plus 3 calves
Brown Swiss	—	—	12 plus 1 calf
TOTAL	4	538 plus 13 calves	716 plus 27 calves

(b) Stock imported from Republic of South Africa on special permits issued by the Republic authorities:

	1.10.60 to 30.9.61	1.10.59 to 30.9.60	1.10.58 to 30.9.59
Pedigree Bulls			
Africander	—	7	—
Aberdeen Angus (Red)	1	—	—
TOTAL	1	7	—
Pedigree Females			
Africander	—	99 plus 4 calves	—
Aberdeen Angus (Red)	9	—	—
TOTAL	9	99 plus 4 calves	—
Grade Bulls			
Africander	10	22	—
Santa Gertrudis	—	3	—
Yellow Africander	—	2	—
TOTAL	10	27	—
Grade Females			
Jersey	8 plus 4 calves	—	—
Africander (Red)	—	—	25
Africander (Yellow)	—	28 plus 10 calves	20
Aberdeen Angus (Red)	90	—	—
Friesland	1	—	10
Shorthorn	1	—	—
TOTAL	100 plus 4 calves	28 plus 10 calves	55

	1.10.60 to 30.9.61		1.10.59 to 30.9.60		1.10.58 to 30.9.59	
	Bulls	Heifers	Bulls	Heifers	Bulls	Heifers
2. United Kingdom						
Ayrshire	1	—	—	—	2	2
Jersey	1	—	2	2	2	3
Aberdeen Angus	—	—	—	—	2	1
Hereford	1	—	1	—	1	—
Shorthorn	—	—	—	—	2	1
Sussex	—	—	—	—	2	—
Red Poll	—	—	1	1	—	—
TOTAL	3	—	4	3	11	7
3. Holland						
Friesland	1	3	1	—	—	—
4. U.S.A.						
Hereford	—	—	1	—	—	—
5. Canada						
Jersey	—	—	1	—	—	—
TOTAL OVERSEAS IMPORTS	4	3	7	3	11	7

(6) Soil Conservation

a. ARABLE AREAS

While good progress continues to be made in the protection of arable lands it is disturbing to have to report that contour ridges, in particular, are not always being constructed to the recommended specifications and even more serious is the growing tendency to neglect their maintenance. Undue extra expense will undoubtedly result. The importance of these works cannot be over stressed.

A table indicating what has been achieved is given in Appendix IIIA.

b. African Cultivation

The Conservation Assistants continue to make valuable contributions to the drives organized by the Committees to reduce erosion and improve the output from gardens and lands operated by Africans on European farms.

c. Roads and Railways

Close co-operation continues to exist between this Department, the Rhodesia Railway Authorities, the Department of Roads and individual road councils in matters pertaining to stormwater disposal and drainage. Conservation Officers on occasions are also called upon to advise on road alignment.

d. Veld Management

Where veld management is concerned, officers have continued to stress at every opportunity the underlying principles involved. Particular mention was made of paddocking, water supplies, summer management and gains, overall stocking rates, bush control and rotations with periodic rest. Where the application of these particular principles is invariably observed, much improved performance is reflected in the stock. A great deal remains to be done in this field.

General Management

In Matabeleland due to de-stocking during the drought in conjunction with the early advent, good distribution and the length of the rains, grazing was available in abundance. The recovery of grazing areas following two poor seasons exceeded all expectations.

While many farmers are appreciative of the importance and necessity of providing rest periods, although more as a measure to provide for winter grazing, the significance of correct stocking in ensuring stability of the veld and production on a sustained basis is not sufficiently acknowledged and observed. The most serious overstocking occurs during the first three months of the growing season, resulting in poor summer gains. A trend of thought which is slowly gaining ground is the need to take full advantage of potentially good summer gains by following systems and methods of veld and livestock management which will ensure maximum gains during this period. Amount and cost of winter supplementary feeding are correlated with the gain the animal has made during the growing season. In the interest of increased production and economy, every endeavour is being made to encourage farmers to stock at the annual rate of stocking during the first three months of the rainy season, as opposed to concentrating stock during the period at high stocking intensities—as is too commonly practised by farmers.

Veld Fires

Although there has been an abundance of grass, the incidence of grass fires has been low, apart from the Midlands Region. This is a testimony to the efforts and propaganda of the Natural Resources Board and I.C.A. Committees. The advent of more cattle in many I.C.A.s is making farmers fire conscious and has resulted in good progress being made in the establishment of fire-breaks along boundary and internal fence lines.

Bush Encroachment

This continues to be a most serious conservation problem, particularly in the ranching areas of the country. Matabeleland has placed great emphasis on the biological aspects of control, viz., correct stocking, provision of rest periods and systematic burning to maintain an equilibrium between bush and grass.

Through the medium of field trials the efforts to demonstrate the principles of correct veld utilization and economic methods of bush control have been intensified.

Experimental work on the control of *Lantana camara* has continued, with good results in the Eastern Districts. The economics of field-scale eradication require investigation.

Fencing

The provision of the Farm-Planning service and the widespread interest in beef production have proved of great value in encouraging fencing development on a planned basis. There is a definite need for more fencing development, particularly on some of the larger holdings.

(7) Water Conservation

Though the number of dams constructed during the year fell below the record of last year, it is interesting to note that the quantity of water stored was virtually the same, the average capacity of the dams having increased by some 14 per cent.

An examination of the figures in Appendix IV A. reveals an increase of 100 per cent. in the mean size of the dams in Mashonaland. This is largely attributable to the fact that most of the dams built were constructed in the Umvukwes areas where dams supply, in most instances, the only water available and must, in consequence, have sufficient capacity for all-year-round use.

a. Mechanical Units

I.C.A. Units

Only six dams were built by I.C.A. units during the year and the last of these units will probably soon cease to operate. I.C.A. machines were operated in various parts of the country several years ago and did sterling work in providing stability in water supplies for the farming community.

Government Units

There has been a decrease in the demand for Government units. This is mainly due to the reduction in the amount of money made available for subsidy.

The fleet of Government tractors has temporarily been reduced from eleven to seven but it is expected that the number will increase again in a few months time when the next dam-building season begins.

An encouraging feature is the extent to which farmers, with the assistance of contractors, have increased the number and sizes of farm dams built by them. In the past five years the former proportion has increased from 37 per cent. to 80 per cent.

Year	Farmers and Contractors		I.C.A. Committee Units		Government Units		Total No.
	No.	%	No.	%	No.	%	
1955–56 . .	130	36·9	84	23·8	139	93·3	353
1956–57 . .	146	46·9	50	16·1	115	37·0	311
1957–58 . .	253	70·1	42	11·6	66	18·3	361
1958–59 . .	286	69·2	32	7·8	95	23·0	413
1959–60 . .	585	75·2	18	2·3	175	22·5	778
1960–61 . .	535	79·6	6	0·9	131	19·5	672

(8) Field Trials

A total of 113 field trials and demonstrations were carried out in the Southern Rhodesia Regions by staff of the Department on various aspects of crop and animal husbandry and land use. Valuable information was obtained from trials on new crop varieties, systems of animal feeding and supplementation and veld management.

Details of various trials and demonstrations carried out by this Department during the year are given in Appendix V.

(9) Advisory Services

a. Visits made by Officers of the Department

There has been a decrease in the number of visits made in Southern Rhodesia. This can be attributed mainly to the far greater use being made of mass media methods of reaching the farming community such as discussion groups, field days, and popular publications, instead of personal visits. While the total number of visits has decreased the advice given has increased considerably and has reached a greater number of farmers. Details of visits by Regions is given in Appendix VI A.

b. Farmers' Days, Courses and Discussion Groups

Courses, farmers' days and discussion groups dealing with aspects of veld management, beef, dairying, sheep, pastures, farm machinery and crop production were organized in the Regions and were generally well attended. African tenant-farmers have been invited to field events in several areas—a reflection of the increasing contact that is being made between the European and African farmers on agricultural problems of common interest.

c. Agricultural Shows

The Department exhibited and assisted at 17 shows, maintaining the high standards set in previous years. At the Royal Salisbury Show and shows in the Midlands the main theme was aligned to the "World Seed Year" sponsored by F.A.O. Officers of the Department acted as judges and stewards and assisted both European and African show committees.

In Matabeleland the Department was responsible for planning and organizing the Ministry of Agriculture's exhibit at the Central African Trade Fair. This exhibit achieved limited success and strongly underlined the need for sufficient funds for exhibiting at International Shows and the appointment of a publicity or information officer to plan and organize shows and exhibitions.

A disappointing feature this year was the reduced number of farmers' exhibits compared with previous years. The standard of these, however, remained high.

d. Conservation Field Visits for Teachers

It is pleasing to report that an increased awareness of the problem of the conservation of natural resources exists amongst teachers, particularly in Matabeleland. This is largely a result of the activities of the Conservation Education Sub-committee, strongly supported by the Natural Resources Board and the Ministry of Education.

The adoption of schools by I.C.A. Committees in the Midlands is considered an excellent idea; this enables Committees to sponsor visits of school children to farms. One-day field visits by teachers and children to various places of agricultural interest were organized in various parts of the country during the year.

The Midlands Region has inaugurated a Conservation Education Action Committee which will foster, co-ordinate and organize conservation education in the Midlands.

e. Conservation Week

Due to the active support and enthusiasm of Matabeleland teachers, Conservation Week, emphasizing Wild Life Conservation, was very successful in every way in that Region. Many schools throughout the country actively supported Conservation Week and the theme "Wild Life Conservation" had a very wide appeal. Teachers co-operated admirably in communicating the conservation message to their pupils at all levels and exhibitions by the children were of a high standard.

(10) **Experimental Farms**

a. Karoi

Good progress has again been made on the farm and the new Advisory Committee that has been set up has held its first meeting, greatly stimulating the interest of I.C.A. Committees of the West Hunyani Group.

Several changes in policy were implemented and greater emphasis was placed on the production of beef. The major changes in policy were:

(a) Disposal of the dairy herd.

(b) The reduction of the beef herd to 30 cows; young stock and feeders brought in, enabling a wider range of trials to be undertaken.

(c) An alteration in the cropping rotation to three years of crops and three years of grass. This change was thought necessary in consequence of the low yields that were achieved in the case of second-year maize and fourth-year grass.

A series of field trials gave useful information, the single and No. 13 double hybrid maize varieties giving impressive yields, while the response to Grasslands' Rhizobium in the soya-bean variety trial was an outstanding feature. The beef feeding trials, comparing the use of urea with groundnut cake, showed that the urea could replace half the groundnut cake. Feeding trials on ewes and lambs have also yielded useful information.

b. Chipinga

The Farm Liaison Committee, which includes local farmers, has settled down to implementing the planned programme for the year.

The main work of the Experiment Station has been concerned with coffee production. A greatly expanded research programme in this field is under consideration in collaboration with the Department of Research and Specialist Services.

Excellent yields of maize in well established Star grass land, late ploughed, have been obtained and most satisfactory progress has been made in developing a cheap, practical method of calf rearing under wet summer conditions. There has also been a marked increase in the average yield of the Dairy Unit.

D. NORTHERN RHODESIA

(1) **Organization**

During the year ending 30th September 1961, no changes were made in the organization of the Region which continued to function efficiently. The ministerial policy was carried out and considerable assistance was given to the Northern Rhodesia Government in performing the technical duties for the Farmers' Debt Adjustment Board, the Agricultural Lands Board and the Natural Resources Board.

a. Head Office

The administrative section has worked satisfactorily during the year and there have been several staff changes in the Registry Office.

b. Intensive Conservation Areas

With the exception of the Crown Land farms in the Abercorn area and some isolated Crown Land farms in the North-Eastern and North-Western provinces, all European-occupied farming units are included in the Intensive Conservation Area system.

The present position regarding Intensive Conservation Areas is as follows:

Declared during the year—nil.

Investigated or under investigation for declaration—nil.

Subdivision during the year—nil.

Under investigation for subdivision—North Lusaka I.C.A.

Boundary changes—nil.

Investigated or under investigation for boundary changes—Mazabuka and Lower Kaleya.

Declared to date—twenty-six I.C.A.s (details regarding I.C.A.s are given in Appendix II B.).

c. Committees and Their Activities

Most Committees have functioned well during the year. Attendances at meetings have been fairly good, but the farming public's attendance at I.C.A. annual general meetings has been poor in almost all cases.

I.C.A. field days and discussion groups remained popular and were well attended, particularly those on beef and tobacco.

Newsletters have been issued regularly on a Group basis, Committees providing the material with contributions from the Department.

d. The Group Committees

Group Committee activities have been fairly strong. Further attempts to build up these Committees are being made and, where possible, outside chairmen who are prominent public figures are being asked to take the chair. It is, however, difficult in some cases to get suitable persons to accept this responsibility.

(2) **Staff**

During the year there were a number of staff changes. Group Conservation Officer, Mr. B. W. R. Wilson was promoted to Additional Regional Conservation and Extension Officer, Mashonaland. Mr. Wilson's post as Group Conservation and Extension Officer, Lusaka, was filled by the transfer of Mr. L. Passanah from Mazabuka. Mr. I. D. Campbell-Gibson was transferred from the Copperbelt to Mazabuka as Group Conservation and Extension Officer.

Group Conservation and Extension Officer, Mr. J. Hayward, moved to Broken Hill early in the year and his post at Kalomo was filled by the transfer of Mr. J. V. Williams from the Mashonaland region.

The Senior Tobacco Extension Officer, Northern Rhodesia, Mr. R. J. C. Hope, was promoted to Chief Tobacco Extension Officer and his post was taken over by Mr. J. Jameson. Two Conservation and Extension Officers, Messrs. Folmer and Barnes, are undergoing full-time tobacco training, while Conservation and Extension Officers, Messrs. Brune, Mayne and Wilby, are undergoing part-time tobacco training.

The post of Mechanical Engineer was re-advertised without success. Mr. K. Moffat was appointed Chief Mechanical Engineer, Head Office, but remained posted in Northern Rhodesia during the year and performed the duties both of Mechanical Engineer, Northern Rhodesia, and Chief Mechanical Engineer.

Generally it may be said that the staff position has been satisfactory.

a. Departmental Committees

The Regional Director and/or Regional Conservation and Extension Officer served on the following committees during the year:

Farmers' Debt Adjustment Board (member).
Agricultural Lands Board (member).
Eastern Province Loans Co-ordinating Committee (chairman).
Tsetse and Trypanosomiasis Committee (member).
Natural Resources Board (advisory).
African Affairs Sub-committee of the Natural Resources Board (member).
Education Sub-committee of the Natural Resources Board (member).
Drainage Sub-committee of the Natural Resources Board (member).
Regional Planning Sub-committee of the Natural Resources Board (member).
Bush Encroachment Sub-committee of the Natural Resources Board (member).

The Senior Tobacco Extension Officer served on:
The Eastern Province Loans Co-ordinating Committee (member).

The Senior Animal Husbandry Extension Officer served on:
The Livestock Improvement Committee (chairman).

Other Committees and Boards on which officers served were:
Regional Planning Sub-committee of the Natural Resources Board—Regional Conservation and Extension Officer and Planning Officer (advisory).
Water Board of Northern Rhodesia—Senior Conservation Engineer (member) and Irrigation Officer (advisory).
Southern Rhodesia Sabi Catchment Technical Advisory Committee—Planning Officer (member).
Copperbelt Lands Advisory Committee—Group Conservation and Extension Officer (advisory).
Northern Rhodesia Irrigation Development Committee—Irrigation Officer, Planning Officer and Regional Conservation and Extension Officer (chairman).
Experiment Farms Advisory Committees—Regional Conservation and Extension officer (chairman).

In addition, officers attended meetings of the provincial teams in some provinces and the Natural Resources sub-committees of provincial teams, meetings of councils, commodity committees of the Northern Rhodesia Branch of the National Farmers' Union, and have assisted the committees of various agricultural show societies.

(3) **Transport**

The present arrangement whereby most officers use their own transport continues to be satisfactory.

(4) **General Agricultural Crop and Livestock Conditions**

a. Climate

The 1960–61 season has, in most areas, been reasonably favourable from the climatic aspect. It certainly was not as difficult as the 1959–60 season when a prolonged dry spell was encountered.

Apart from the eastern portion of Mazabuka and the southern section of Lusaka, fairly general rains occurred from about the middle of November to the beginning of December. A dry spell then followed. In the southern section of the country the rains continued, being interspersed with sunny periods, and growing conditions were good. The Broken Hill and Mkushi areas, however, had continuous wet overcast conditions and the total rainfall figures were well above the average. In the Eastern Province the general pattern of rainfall was similar to that of the southern section of the country with some heavy falls being recorded.

Seasonal rainfall totals showed wide variations within the farming areas, ranging from 30 to 52 inches in the Southern Province to 45 to 60 inches in the Mkushi area.

b. Financial Position

(i) *The Farmers' Debt Adjusment Board*

The Department continued to assist the Farmers' Debt Adjustment Board, to which a considerable amount of help was given by both the technical and clerical staff.

(ii) *Farmers' Debt Consolidation Scheme*

This scheme was set up to assist those farmers whose debts were in need of adjustment as it was considered in 1960 that such a scheme would be required. However, due to the good season experienced in 1960–61, the number of applicants for this scheme has fortunately been very small.

c. Crop Production

Food Crops

(i) MAIZE

A record crop of about a million-and-a-half bags has been achieved this year, giving an average of some 14 bags per acre. This is an increase of 4 bags per acre compared to the 1960 crop and it is considered that this position, apart from general climatic conditions, can be greatly attributed to the employment of better techniques.

Because of the late rains the incidence of "cob-rot" was higher than usual, especially in the Broken Hill area. Yields of approximately 30 bags per acre have been obtained on relatively large acreages on a number of farms. Southern Rhodesia Hybrid No. 12 was extensively used and gave good results. The use of an insecticide to control "corn rootworm" is becoming more widespread and at the same time the control of ants and other pests is being carried out.

In the tobacco growing areas excellent crops of maize following tobacco have been reaped. The early ploughing-in of tobacco stalks and the subsequent hand planting gave good stands. Yields of between 20 and 30 bags of maize per acre were achieved.

Although good results have been achieved this year the following aspects of maize production still require emphasis in many areas:

(1) Drainage of the wetter soils by the ridge and furrow method.

(2) Deep ploughing while the soil is still moist, especially on the heavier textured soils.

(3) The incorporation of organic matter whether in the form of green crops, maize stover or grass.

(ii) SORGHUMS

The Framida and Barnard Red varieties were mainly used, one farmer in the Chilanga I.C.A. producing 15 bags of grain per acre. Many farmers, however, gave insufficient attention to the growing of the crop and consequently reaped low yields.

(iii) GROUNDNUTS

Increasing attention is being given to groundnut production in Northern Rhodesia. Some farmers this last season produced good yields ranging from 1,500 lb. to 3,000 lb. of shelled nuts per acre. Increased supplies of seed of the "Makulu Red" variety—which has given good results on a field scale—are now available. It has shown greater resistance to diseases, especially *Cercospora* leaf-spot, than the other varieties. It is anticipated that the very satisfactory yields achieved by those growers who have used Makulu Red will have an impact on other farmers.

(iv) POTATOES

Late blight on potatoes caused considerable losses and consequently an acute shortage in the case of the March-sown crop. Seed potatoes were sold as "ware" potatoes because of the higher prices paid. This will cause a serious shortage of seed potatoes for the November plantings.

(v) WHEAT

This crop is grown in the Chisamba, Lusaka and Mazabuka areas. Due to the low rainfall in the Kaleya River Catchment, the stream-flow of this river was low and irrigation for wheat and other crops had to reduced.

(vi) VEGETABLES

Most of the towns in Northern Rhodesia are supplied with vegetables from local sources and the quality of the product is improving. Tomatoes are being grown on an increasing scale during the rains, some farmers producing excellent crops.

Cash Crops

(i) TOBACCO, FLUE-CURED

(1) *Seed-beds*

Seed-bed management was good and showed an improvement over the previous year. There is still a tendency to sow the first seed-beds about two weeks too late for adequate hardening-off to be carried out—this is particularly noticeable in the Mkushi and Fort Jameson areas.

(2) *Land Preparation*

Where the soils have been early ploughed, the standard of land preparation has been good. However, in many cases where late ploughing has been done, little depth of ploughing has been obtained and it is becoming evident that in such cases heavier equipment will be necessary and ripping may have to be carried out.

(3) *Crop Management*

Though a small acreage in the Southern Province and Broken Hill areas was planted with water during late October, ideal planting conditions during early November in most areas encouraged the planting of about 80 per cent. of the crop before the end of the month. In the Eastern Province, due to adverse weather conditions, only about 30 per cent. of the crop was planted early with water.

The crop received a severe setback due to drought conditions which occurred from late November to early January, but subsequent rains improved its growth.

In the Mkushi area, where subsoils are heavy, a late release of nitrogen occurred about 3½ months after ploughing wet soil or after the first soaking rains had fallen on ploughed soil. This encouraged the spread of spot disease which caused a deterioration in both yield and leaf quality. This problem is now under active investigation.

Only in the longer settled areas in the Southern Province is the planting of improved pastures in rotation becoming general. In other areas, virgin lands are still generally being used although, in the Fort Jameson area, land which has been reverted for seven to ten years is used in addition to virgin land.

(4) *Reaping*

The prolonged wet spell from January to March which was accompanied by cloudy conditions and minimum sunshine, encouraged the rapid ripening of the crop. In many cases, existing barn accommodation was insufficient and many lands had to be abandoned. False ripening due to climatic conditions deceived many farmers and, as a result, some leaf was reaped immature. In the Eastern Province, reaping of even barns was difficult but the standard of reaping suffered through lack of supervision and through pressure on labour when rapid reaping over large areas occurred. On some farms, leaf was badly handled after reaping as no attention was paid to the loading of the trailer and stacking of the leaf for tying, causing bruising and breaking to occur.

(5) *Curing*

Rapid ripening caused many farmers to overpack their barns and cure too rapidly. Consequently, there were numerous cases of sponging and slate with slick immature-looking close-grained tobacco being produced. There was also a tendency to over-colour very ripe leaf.

In the Mkushi area, curing of the early crop presented no difficulty until the late release of nitrogen took place, after which a large percentage of the top leaf went black in the barns.

(6) *Bulking*

This was generally well done, though shortage of space was often a problem on some farms.

(7) *Grading, Baling and Presentation*

More farm grading was carried out this year than in the previous season and considerable interest was shown in work study methods. However, efficient grading was handicapped by lack of facilities, particularly good lighting—the shortage of which was aggravated by cloudy conditions. Consequently, there was some mixed grading.

(8) *Pests and Diseases*

Diseases in the seed-beds were negligible; those that did manifest themselves were kept in check by spraying programmes efficiently carried out. Isolated cases of anthracnose were reported.

In the land, alternaria, frog-eye and angular leaf-spot were widespread, but particularly in the Broken Hill and Mkushi areas after the late release of nitrogen occurred. Frenching was common in the Mkushi area and bushy-top was severe in the Southern Province, particularly on the later planted tobacco, but this decreased northwards and was practically unknown at Mkushi. Isolated cases of Granville wilt were reported in the Chisamba area.

In the barns, barn-rot and barn-spot occurred in varying degrees of severity in all areas.

(ii) TURKISH TOBACCO

The main area in Northern Rhodesia growing this crop is the Southern Province and from the quality of leaf produced there, it appears that this is where the main production of this crop should be concentrated. Bushy-top, which was most severe in the Southern Province, occurred in all plantings but reached serious proportions in the later crop.

(iii) BURLEY

The main area producing Burley tobacco this season was the Eastern Province. Prices were good and Burley growers received higher average prices than many of the flue-cured tobacco growers. The acreage is estimated at 1,300 acres and production at 900,000 lb., giving an estimated yield of 692 lb. per acre.

For the coming season in the South-Western Tobacco Marketing Board area of Northern Rhodesia, 16 growers will plant an estimated 50 acres for the production of cigarette Burley.

(iv) SEED PRODUCTION

Owing to the high cost of producing vegetable seed and the low prices offered, vegetable seed production should be considered only after further research work has been done in this field in Northern Rhodesia. Of the 17 farmers who tried it last year, only a few remain in production. Transport costs, especially for pea seed, narrow the margin of profit.

(v) CITRUS AND SUB-TROPICAL FRUIT

(1) *Citrus*

Plantings of citrus have now almost ceased except on a small scale. There are now approximately 1,000 acres of citrus planted and this will be sufficient for Northern Rhodesian requirements for the next few years. Quality of the fruit is good.

(2) *Bananas*

Banana production is rapidly on the increase and it is anticipated that in two to three years time Northern Rhodesia will be self-supporting. The main development is taking place in Lusaka and in the Zambesi Valley. It is expected that about 100 acres will be planted over the next few years. The quality of the bananas being grown has improved considerably and the product is considered to be superior to that of the imported article. Farmers in the vicinity of Lusaka with adequate sources of cheap water can produce this crop reasonably economically.

(3) *Avocado Pears*

There are sufficient avocado pears to supply local requirements. A farmer on the Copperbelt is investigating the possibility of extracting oil from this fruit for export.

(4) *Pineapples*

Trial plantings of this crop in Northern Rhodesia indicate that it can be grown successfully provided that adequate fertilizer is given and that it is irrigated in the dry season.

(5) *Mangoes*

This crop is not grown on a commercial scale in the country.

Fodder Crops

The need for growing fodder crops for dairy, beef and poultry production continues to be emphasized by the Department's field staff in Northern Rhodesia.

The use of dhal as a perennial legume for fodder production has increased considerably and it is estimated that there must be over 2,000 acres planted. This crop is well suited to conditions in Northern Rhodesia as it does not become "frosted off" but remains green throughout the year. Trials on varieties and weight gains in the dry season by animals grazing this crop are being carried out.

Legume silage from jack-beans and sunnhemp is also being tried out on an increasing scale, plus the use of soya-beans for replacing bought concentrates.

d. Livestock Production

The climatic conditions prevailing during the year have been good for livestock. In certain areas the early rains were somewhat later than normal and were also sporadic which caused a delay in the spring flush of grass.

(i) BEEF CATTLE

There has been a continued improvement in the feeding of beef cattle and a much wider adoption of sound cattle fattening and winter supplementation practices. The management of cattle has shown some improvement but on many farms cattle handling facilities leave much to be desired. It is, however, pleasing to record that farmers are appreciating the value of cattle weigh-bridges. The good veld grazing available during the winter in many parts of Northern Rhodesia has made the fattening of cattle an easier proposition than in Southern Rhodesia with the result that relatively few slaughter cattle are offered for sale in the April-June period.

The high prices offered for slaughter cattle in December encouraged many producers to finish cattle for this period and in some instances disappointing results were obtained. Widespread use has been made of various types of urea/salt blocks during the winter period to provide a source of non-protein nitrogen. The results obtained have shown considerable variation depending primarily upon the amount of quality roughage on offer and upon the daily intake of the lick. The demand for weaner and feeder steers has increased and exceeds the supply. On the other hand, the market for breeding stock is limited and the older established producers are not finding outlets for their surplus heifers.

The increased efficiency obtained in cattle fattening has not been matched in the breeding herds and greater attention must be paid to them as they are the foundation of the beef industry. Increased production will be dependent upon increasing the calving percentage, reducing the number of dry stock carried and taking advantage of the profitability of fattening cull cows for sale during the off-season.

The Cold Storage Commission made allocations of grazers on a limited scale due to the shortage of such cattle within Northern Rhodesia. They provided farmers with financial assistance to purchase weaner and feeder steers for fattening. The demand by farmers for financial assistance in various forms to purchase cattle is very great and exceeds the present resources. The Northern Rhodesia Government Loan Cattle Scheme, which is in future to be handled on their behalf by the Cold Storage Commission, may help to meet some of the demands for breeding stock by farmers with limited finance.

(ii) DAIRY CATTLE

Milk production has again increased and the price paid by the Co-operative Creameries of Northern Rhodesia has been maintained at a level comparable to that paid in the previous year, because producers retained 15 per cent. of their production on their farms. The number of registered milk producers rose from 169 in September 1960, to 177 in September 1961.

During the year farmers attempted to reduce their costs of production by decreasing the amount of purchased feed. In a few instances this proved successful, particularly where crops like soya-bean replaced purchased oil-meals, but in far too many cases the expensive purchased foods have been removed and have not been replaced with adequate amounts of home-grown feeds.

(iii) SHEEP

An increased interest has been shown in the use of Dorper rams on the existing Black Head Persian type sheep. At present sheep do not materially contribute to the agricultural output. The slow but steady increase taking place will provide foundation stock within the country for expansion at a later date when the farms are more developed.

(iv) PIGS

The Northern Rhodesia pig population has continued to decline and there are no indications of a likely increase in production, despite the recent fall in the value of maize on the farm.

(v) POULTRY

The year was generally a good one for the poultry farmer in Northern Rhodesia with adequate markets for egg and table poultry for which good average prices were achieved. Laying flocks remained constant and the noticeable reduction in flocks in the Southern Province during recent years has stopped. Demand by Africans for eggs, especially on the Copperbelt when the prices are lower, is increasing and producers find that this outlet is excellent for the sale of pullet eggs.

Local production of turkeys and ducks has increased, as has that of table poultry but, in the latter case, to a lesser extent than during the previous year. Quality and presentation have improved with some competition between producers in this respect. The standard of hygiene in many processing plants is greatly in need of improvement.

Considerable extension and advisory work has been carried out and close contact continues to be kept with all aspects of the poultry industry in Northern Rhodesia.

(5) Livestock Improvement Scheme

The Livestock Improvement Scheme has continued to be administered by this Department with the help and guidance of the Livestock Improvement Committee.

Essentiality Certificates were granted for the importation of pedigree cattle but the importation of ordinary grade dairy females was not allowed in view of the present state of the dairy industry. It will be noted from the following statistics that there has been a marked decline in the importation of all classes of livestock and that the number of applications for grants under the scheme has also declined.

ESSENTIALITY CERTIFICATES ISSUED

Pedigree bulls	39 head
Pedigree dairy females	20 head
Sheep—pedigree rams	8 head

APPLICATIONS FOR GRANTS

Received	42
Approved	34
Expenditure	£1,375

IMPORTATIONS FROM REPUBLIC OF SOUTH AFRICA

	1.10.60 to 30.9.61	1.10.59 to 30.9.60	1.10.58 to 30.9.59
Pedigree Bulls			
Ayrshire	—	1	2
Friesland	11	18	21
Guernsey	—	—	2
Jersey	1	14	16
Aberdeen Angus	—	3	1
Africander	29	90	102
Hereford	—	2	9
Shorthorn	2	4	1
Sussex	—	1	6
South Devon	—	2	2
Red Poll	—	—	5
Brown Swiss	1	2	1
Brahman	1	—	—
Dexter	—	—	1
Siementhalar	—	2	1
North Devon	—	—	1
TOTAL	45	139	171

	1.10.60 to 30.9.61	1.10.59 to 30.9.60	1.10.58 to 30.9.59
Pedigree Females			
Ayrshire	—	—	—
Friesland	—	45 plus 4 calves	47
Guernsey	—	—	9
Jersey	—	84	58 plus 3 calves
Africander	—	90 plus 4 calves	69 plus 14 calves
Sussex	—	—	—
Brown Swiss	—	9	—
North Devon	—	—	—
Red Poll	—	12 plus 2 calves	6 plus 1 calf
Hereford	—	12 plus 2 calves	—
Dexter	—	—	4 plus 3 calves
Siementhalar	—	—	3 plus 1 calf
TOTAL	Nil	252 plus 12 calves	196 plus 22 calves
Grade Females			
Ayrshire	—	—	—
Friesland	—	370 plus 7 calves	465 plus 17 calves
Jersey	—	168 plus 6 calves	232 plus 6 calves
Guernsey	—	—	—
Shorthorn	—	1 plus 1 calf	—
South Devon	—	—	—
Sussex	—	—	—
Dexter	—	—	7 plus 3 calves
Brown Swiss	—	—	12 plus 1 calf
TOTAL	Nil	539 plus 14 calves	716 plus 27 calves

STOCK IMPORTED FROM THE REPUBLIC OF SOUTH AFRICA UNDER SPECIAL PERMITS ISSUED BY THE REPUBLIC AUTHORITIES

	1.10.60 to 30.9.61	1.10.59 to 30.9.60	1.10.58 to 30.9.59
Pedigree Bulls			
Africander	—	7	—
TOTAL	—	7	—
Pedigree Females			
Africander	—	99 plus 4 calves	—
Grade Bulls			
Africander	—	22	—
Santa Gertrudis x Africander	—	3	—
Africander (yellow)	—	2	—
TOTAL	—	27	—
Grade Females			
Friesland	—	—	10
Africander (red)	—	—	25
Africander (yellow)	—	28 plus 10 calves	20
TOTAL	—	28 plus 10 calves	55

SHEEP IMPORTED FROM THE REPUBLIC OF SOUTH AFRICA

	1.10.60 to 30.9.61
Pedigree Dorper rams	8
Pedigree Black Head Persian rams	3
TOTAL	11

a. GOOD CATTLE PRODUCTION BOUNTY

A total of 275 farmers applied for the bounty during the year ending 30th June 1961 and of these 263 were approved. The total sum paid out amounted to £29,727 compared with £28,086 in the previous year.

The rates of payment and the number of cattle branded are set out below:

Rates of Payment

	£ s. d.
First 100 head	1 10 0 per head
101–200 head	1 0 0 per head
Over 200 head	10 0 per head

Distribution

Group	*No. of Head Approved*	*Amount Paid* £
1–100	15,954	23,931
101–200	4,180	4,180
Over 200	3,232	1,616
TOTAL	23,366	£29,727

The scheme continues to provide farmers with assistance to carry out capital development for the benefit of their cattle and at the same time encourages a reasonable standard of cattle management.

(6) **Production from Irrigation**

a. Progress of Irrigation in Northern Rhodesia

During the present season there has been a steady increase in the development of new small irrigation schemes. In addition to the new schemes many of the older ones have implemented considerable improvements in their water distribution efficiency and irrigation crop management practices. These improvements have invariably brought about a reduction in labour requirements, more efficient use of water supplies and more economical production.

There are now ten land-planes in operation along the line of rail from Livingstone to Kitwe. Farmers who have land-planed their lands have provided a clear demonstration in all the main irrigation areas that the threshold to efficient irrigation is simple to cross.

During the year information has been accumulated on the infiltration rates of the various soils and these have been used in systematic designs of flood irrigation layouts. Increased efficiency of overhead spray irrigation has been one of the problems which has been given special attention during the year. Many Northern Rhodesia farmers originally selected overhead layouts without making certain that the rate of precipitation was suited to their soil's infiltration rate. Many overhead schemes are based on sprinkler spacings of sixty feet and the effects of wind are not given the consideration they deserve. Very few farmers appreciate the minimum requirements pertaining to design, installation and performance of sprinkler irrigation equipment.

b. Liaison with Other Departments

Close liaison has been maintained with the Departments of Water Affairs, African Agriculture, Natural Resources, Lands, Research and Specialist Services, and all sessions of the Northern Rhodesia Water Board were attended. During the year field officers made over a hundred Water Board inspections.

(7) **Soil Conservation**

a. General

Northern Rhodesia is a relatively flat country and in many areas drainage rather than contouring is the major problem. However, there are areas such as Kalomo, Choma and Mkushi where mechanical protection is always needed, due to tobacco lands being opened up. Favourable progress has been made in some of these areas to complete the backlog of contouring that is necessary and with Regional Planning Phase I being almost completed, more emphasis can be given to this work.

Great emphasis is still being placed on the need for careful land selection. In the Broken Hill and Mkushi areas, it is realized that soil selection for tobacco lands is most important. In the Mkushi area nearly 90 per cent. of the land to be used for tobacco in 1962 has been examined by the Department for suitability.

b. Mechanical Protection of Arable Land

Slightly less contours were pegged in 1960–61 than in 1959–60. The major emphasis on this work came from the Choma area and good progress has been achieved there so that the backlog of work has now been somewhat reduced. Greater emphasis on the mechanical protection of arable land is being given in the Kalomo and Mkushi areas and allowance has been made in the 1961–62 season's programme for this work to be undertaken.

There has been a noticeable increase in the number of storm drains constructed this year, which is almost double that of the year before. This is mainly due to the emphasis given to land protection by the Regional Plans.

Statistical details are given in Appendix III B.

c. Roads

Little progress has been made by farmers in aligning their roads properly. Great emphasis was placed on proper road realignment in the regional plans and finance was set aside to enable this work to be done, but not much has actually been carried out.

d. Drainage

Ridge and furrow layouts in the flatter sections of the country continue to be laid out and 1,395 acres were established during the year. Sufficient advantage has not been taken of the overall regional planning drainage schemes, whereby farmers are encouraged to fit their ridge and furrow layouts into the broad framework of these major schemes.

The implementation of the drainage scheme in the Chisamba (East Wangwa) Regional Plan has now been completed and this should assist in getting rid of excess water more rapidly. The drainage of the North Lusaka area, which is being done by the Department's heavy units, will be completed before the commencement of the rains.

The major portion of the drainage schemes has now been completed and it is hoped that farmers will take advantage of this fact by constructing their own internal works.

e. Grazing Areas

Veld management, bush encroachment, fencing and fire are all directly interrelated. Farmers have constructed a considerable amount of fencing over the last few years and have put in fire-guards. Many of them are aware of the basic principles of sound veld management but comparatively few apply these in practice. Until fire can be controlled, no proper system of veld management can be followed.

Demonstration of veld management on whole farms must be carried out in order to show what can be done and the dangers of bush encroachment must be continually stressed at all levels.

(8) Water Conservation

During the year 39 dams were built, with a total capacity of 352 million gallons; 13 of these dams were constructed by farmers, the remaining 26 being built by the Government units under the Regional Planning Scheme.

There is definitely a need for a greater distribution of cattle watering points and for further development of water for irrigation to supply relatively cheap protein-rich feed for livestock. In parts of Mazabuka and Lusaka, with the dry conditions experienced, lack of water during this dry season has affected many farms.

Details of dams constructed in the various groups are listed in Appendix IV B.

(9) Mechanical Units

a. General Remarks on Staff

Despite a general reduction in staff, a record output of work was achieved. This is sufficient testimony to the quality and morale of the men, both European and African.

b. Report on Tractor Groups

(i) EQUIPMENT

Items of heavy equipment owned and operated by the Department in Northern Rhodesia during the year are listed below:

10 Caterpillar D7 Tractors,
1 Caterpillar No. 12 Motorized Grader,
6 Scrapers,
7 Rippers,
3 Bush-clearing Chains,
3 Tree-dozing Stingers,
1 Low-loader,
6 Lorries and sundry Light Transport Vehicles and other Minor Equipment.

The four remaining 3T Caterpillar tractors were boarded during the year and two new 17A models were purchased. The entire fleet, therefore, now consists of 17A tractors.

(ii) WORK DONE

Work continued on the Sabi Valley tsetse-control bush-clearing project. The sum available for the 1960–61 programme was slightly reduced to £65,000 and

work was completed to schedule. The programme has been extended into the next financial year to the extent of £36,000.

Bush-clearing was done in Mkushi, Broken Hill, Chisamba, Kalomo and Choma, and also for the Forestry Department on the Copperbelt. This was the first occasion that the units have worked on the Copperbelt and the success of the work done should lead to further employment there.

Regional planning works, mainly dams and storm-drains, were carried out in Zimba, Kalomo, Monze, Magoye, Mazabuka, Nega Nega, Chilanga, West Lusaka and Chisamba.

(iii) WORKSHOPS

In spite of serious depletion of staff, the increased volume of work was satisfactorily handled.

(iv) ANALYSIS OF WORKING HOURS

The figures given below are for the period 1st July 1960 to 30th June 1961, to correspond with the financial year.

Normal available work hours	= 33,450	
Overtime worked	= 8,480	
Total available hours	= 41,930	
Less servicing hours	= 3,411	
Net available hours	= 38,519	
Hours worked	= 22,990	hours
	59.5%	

HOURS LOST

Moving . . .	1,923	5.0%
Broken down . .	6,454	16.8%
Weather . . .	1,357	3.6%
Awaiting work . .	3,049	7.9%
Other causes . .	2,746	7.2%
	15,529	40.5%

Output per tractor month = 153.5

Working time, which amounted to 2,277 hours more than last year, accounted for a large increase in the overtime performed; this was mainly due to the work in the Sabi Valley and to the use for the greater part of the year of two additional tractors. Monthly output of the tractors was slightly greater than that achieved in 1959–60.

(v) FINANCIAL STATEMENT

The financial year closed with a profit of £7,896, i.e. just under 7s. per working hour. There is no doubt that this profit could be greatly increased by an increase in the availability of regional planning funds, as there were times when the machines were hard pressed for work.

Both from the financial aspect and the output of work, the year must be regarded as a most satisfactory one.

(10) **Field Trials**

Field trials were carried out on all the experiment farms and a limited number were done on private farms. Tobacco experiments on flue-cured, Burley and Turkish tobacco were done in co-operation with the Tobacco Research Board. Trials were also carried out on groundnuts, sorghum and summer wheat in conjunction with the Mount Makulu Research Station.

The following trials and demonstrations were carried out during the 1960–61 season:

Maize variety trials	5
Maize fertilizer trials	3
Groundnut variety trials	2
Groundnut variety fertilizer trials	4
Soya-bean variety trials	4
Sorghum variety trials	2
Dhal variety trials	4
Fodder crop trials	4
Livestock feeding trials	2
Lucerne demonstration	1
Corn root investigation	1
TOTAL	32

Horticultural experiments are being done on the Copperbelt Experiment Farm and small demonstrations and trials on horticultural crops are being undertaken at the Chalimbana Experiment Farm. The maize variety trial at Mochipapa, using S.R.12, yielded 47 bags of maize per acre. The soya-bean trial on the Copperbelt Experiment Farm also indicated that certain varieties are capable of high yield and one of these varieties will be planted out on a bigger scale this year. Small grazing capacity trials and bush eradication plots have been established on the experiment farms at Kitwe and Mochipapa, respectively.

(11) **Advisory Services**

a. General

The number of field visits made by officers of the Department of Conservation and Extension has been maintained. Now that the Regional Planning Stage I has almost been completed the emphasis on other aspects of the work will be increased. Details of visits are listed in Appendix VI B.

b. Field Days and Discussion Groups

A total of 111 field days and discussion groups were held during the year, with an attendance of 4,810, an increase of 1,700 attendances over the previous year.

Special emphasis has been placed on beef production, dairying, tobacco, maize, horticulture, irrigation and land selection. In certain areas poultry discussion groups have taken a prominent part.

The attendances at these functions have varied considerably and all I.C.A. committees are being requested to draw the attention of their farmers to the importance of these advisory meetings.

c. Shows

The shows this year have been disappointing, due to lack of competition and to the way in which material has been exhibited. The quality of livestock, especially slaughter stock, has been good but the number of entries has been disappointingly small. An outstanding exhibit at the Livingstone show was the Zimba Farmers' Association stand.

The Department exhibited at all the agricultural shows that were held and officers acted as judges and stewards.

d. Conservation Education

Due to staff shortages during the year, the Natural Resources Board, which is responsible for the organization of the teacher courses, has had to curtail its activities.

The Department of Conservation and Extension assisted the Provincial Administration by giving lectures to their staff on agricultural matters.

e. Young Farmers' Clubs

This organization continues to be sponsored by the Natural Resources Board.

The full-time Organizer has spent a considerable amount of his time on propaganda for the movement and steady progress has been made. In certain areas the Conservation Officers have taken a prominent part in Young Farmers' Club activities.

There are now 40 clubs affiliated and until further staff becomes available it is not intended to increase this number.

(12) **Planning**

a. Regional Planning

Regional planning was again accepted as a departmental priority. The policy of the Natural Resources Board has been to select works from individual plans so that the maximum benefit can be obtained from the available subsidy funds. These were £40,000 for the 1961–62 financial year. The main effort in regional planning was concentrated in the period January to April so that as many completed plans as possible could be examined and priorities for the implementation of projects worked out well in advance of subsidy funds becoming available. The main works accepted for implementation were communal drainage schemes, major soil conservation works, dams and the realignment of major farm roads.

Major drainage schemes have been given a high degree of priority in 12 regional planning areas. In the majority of cases the works were beyond the ability of the individual farmers to construct. Except for two plans all major drainage schemes of Stage I have now been completed. These works will be of considerable assistance to the farmers affected, as the lack of drainage control has been a serious limitation to successful arable cropping.

The policy of partial implementation has again placed added pressure on the field staff. To date, ten Stage I regional plans are outstanding and it is expected that these will be completed prior to May 1962, so that they may be considered when subsidy funds again become available.

Up to September 1961, 42 plans had been completed, of which eight were completed during the period October 1959 to September 1961. The overall position is given in detail in Appendix VII.

The drafting of all completed regional and farm plans is now up to date. In addition, a start has been made on completing the mapping of all regional plan areas at a standard scale of 1 : 50,000 on an I.C.A. basis. To date, 15 regional plan areas have been completed, of which three have been extended to show possible land use, based on the regional plan land-capability maps.

The drafting of the Mkushi South Tembwe Reconnaissance Soil Survey, 1960, was completed, both on a map and photographic basis.

b. Farm Planning

Now that Regional Planning Stage I has been completed in most areas, Stage II (Farm Planning) will receive more attention.

c. Miscellaneous Planning

(i) GENERAL

The Department has continued to carry out numerous investigations for the Agricultural Lands Board regarding the suitability of certain areas for future farming development. Requests by the Board have also been made for the Department to ascertain whether farms are economically sound or not and to put forward proposals for subdivisions or consolidation of farms.

(ii) MKUSHI

Further planning on the Mkushi Settlement Scheme has now been postponed until the major portion of the present surveyed farms have been alienated. There are now 102 farms completely surveyed. The total number of farms occupied under the settlement scheme is 41.

(iii) COPPERBELT

The First Report of a Regional Survey of the Copperbelt, 1959, was published during the year and the Agricultural Lands Board have requested the Department to carry out detailed investigations into specific areas which, according to the report, should be suitable for development.

The Kafubu Block survey will shortly be completed and recommendations will be submitted as to its future subdivision and the farming policy that should be pursued there. Other areas of land suitable for possible alienation will then be examined at the request of the Agricultural Lands Board.

(13) Government Experiment Farms

a. Mochipapa

The Mochipapa Experiment Farm has made good progress and the work carried out there has been well done and is appreciated by the farming community.

The overall programme has expanded and work on bush eradication and beef production has been enlarged. The main emphasis is on tobacco, both flue-cured and Turkish, with other crops such as groundnuts, maize, legumes and cotton also being investigated. Proposals have been put forward for the development of "Bygum Acres", an adjoining farm, for veld management experiments.

b. Chalimbana

The Chalimbana Experiment Farm's main emphasis continues to be the investigation into the self-sufficiency of home-grown feeds for the dairy animal. However, more importance is now being placed on investigations into aspects of beef production and it is also proposed that veld management be given further consideration. Experiments on varieties and fertilizing of different crops are being continued and a small horticultural section has been established.

c. Copperbelt

The position regarding the Copperbelt Experiment Farm and the possibility of its being flooded by the construction of a large dam has now been clarified. The programme of development for the farm is being continued. The main emphasis is on investigations into the production of fodder crops and horticultural aspects. Emphasis is also being given to veld management and the establishment of an Angoni breeding herd.

d. Msekera

The Msekera Experiment Farm continued to carry out experiments on Burley tobacco and other crops. However, due to its situation on the heavier red soils, no work on flue-cured tobacco is being done.

During the year Advisory Committees for Mochipapa, Chalimbana and the Copperbelt Experiment Farms were set up. These committees consist of farming members, officers of the Department of Research and Specialist Services and the Department of Agriculture (Northern Rhodesia). The Chairman is the Regional Conservation and Extension Officer.

PUBLICATIONS

	Title	*Author*	*Publication*
(1)	Factors that Ensure Good Stands	C. Rose	*Rhodesian Tobacco Journal.*
(2)	A Work Study Method of Dry Planting	G. A. Milligan	*Rhodesian Tobacco Journal.*
(3)	A Useful Sprayer for Urea Mixes	G. A. Milligan	*Rhodesian Farmer.*
(4)	Small Area Weirs	A. J. Mullins	*Rhodesian Farmer.*
(5)	Lucerne: A Cheap Protein-rich Feed	G. D. Goldthorp	*Rhodesia Agricultural Journal,* March/April 1961.
(6)	Grape Production in the Eastern Districts of Southern Rhodesia.	O. H. Jones	*Rhodesia Agricultural Journal,* March/April 1961.
(7)	Kale: A Winter Feed for Dairy Cows	J. M. Tweedie	*Rhodesian Farmer.*
(8)	Review of Certain Experimental Work done on Grasslands Research Station during 1959–60.	Department of Research and Specialist Services in collaboration with the Department of Conservation and Extension.	*Rhodesia Agricultural Journal,* January/February 1961.
(9)	Farmer-built Land-planes	G. D. Goldthorp	*Rhodesia Agricultural Journal,* January/February 1961.
(10)	Two Articles on Business Control in Farming	G. B. Thorpe	*Rhodesian Farmer.*
(11)	Raspberries Grow Well at Inyanga	M. Cassidy	*Rhodesian Farmer.*
(12)	The Silent, Stealthy Determined Enemy—Bush Encroachment.	G. E. Rowe	*Rhodesian Farmer.*
(13)	Flood on Overhead Irrigation	G. Turck	*Rhodesian Farmer.*
(14)	Ducks Help to Control Bilharzia	R. Peacock	*Rhodesian Farmer.*
(15)	Simple Principles of Overhead Irrigation	G. Turck	*Rhodesian Farmer.*
(16)	A Preliminary Estimation of Tractor Costs on Some European Farms in Southern Rhodesia, 1958–59.	G. B. Thorpe	*Rhodesian Farmer.*
(17)	Lantana Clearing: Chisamba I.C.A.	N. Grey	*Rhodesian Farmer.*
(18)	Design and Construction of Flue-cured Tobacco Buildings.	A. N. Pirie	*Rhodesia Agricultural Journal,* July/August 1961.
(19)	Weekly Tobacco Bulletins	R. J. C. Hope and J. Jameson	*Rhodesian Farmer.*
(20)	Lessons from Last Year's Seed-beds	R. J. C. Hope	Tobacco Forum of Rhodesia and Nyasaland.
(21)	Bush Encroachment discussed at Gwelo	G. D. Metcalfe	*Rhodesian Farmer.*
(22)	Revolutionary Reaping Method	J. A. Trenor	*Rhodesian Farmer.*
(23)	Veld Management and Weight Gains	H. L. Cruttenden	*Rhodesian Farmer.*
(24)	The Control of Veld Fires	D. M. Gammon	*Rhodesian Farmer.*
(25)	A Preliminary Report on the Vegetation of the Horseshoe I.C.A.	C. Sharman	*Rhodesia Agricultural Journal.*
(26)	A Preliminary Account of the Vegetation of the Banket and Eldorado I.C.A.	P. Ivy	*Rhodesia Agricultural Journal.*
(27)	The Agricultural Survey of Southern Rhodesia, Part I. The Agro-Ecological Survey	V. Vincent and R. G. Thomas	
(28)	Raindrop Size Distribution, Kinetic Energy and Intensity of Sub-tropical Rainfall.	N. W. Hudson	Paper 96. Inter-African Hydrological Conference, Nairobi, January 1961.
(29)	An Introduction to the Mechanics of Soil Erosion under Conditions of Sub-tropical Rainfall.	N. W. Hudson	Proceedings and Transaction of the Rhodesia Scientific Association, vol. XLIX, Part 2, 1961.
(30)	Erosion Control in the Central African Federation.	D. C. Jackson	In three parts *Quarterly Review,* vol. 3, Nos. 2, 3, and 4, 1961 (Official Publication of the Central African Association of Medical Laboratory Technologists).

A. SOUTHERN RHODESIA I.C.A.s

Region	*Group*	*I.C.A.*
North Mashonaland	*Bindura*	Shamva
		Bindura
		Darwin
	N.-W. Hunyani	Karoi S.
		Karoi N.
		Karoi Central
	S.-W. Hunyani	Angwa N.
		Angwa S.
		Doma
	N.-E. Hunyani	Banket
		N. Ayrshire
		S. Ayrshire
	S.-E. Hunyani	Trelawney
		Darwendale
		Gwebi-Hunyani
	N. Mazoe	Horseshoe
		Umvukwes
		Centenary W.
South Mashonaland	*N. Marandellas*	Wenimbi
		Bromley
		Marandellas N.
	S. Marandellas	Marandellas W.
		N. Wedza
		S. Wedza
	N.-E. Salisbury	Arcturus
		Ruwa
		Salisbury W.
	S.-E. Salisbury	Salisbury S.
		Norton
		Beatrice
	S. Mazoe	Glendale
		Barwick
		Morodzi
		Tatagura
Matabeleland	*Gwaai*	Lower Khami
		Lower Umgusa
		Upper Khami
		Upper Umgusa
		Bubi
		Inyati
	Shangani	Essexvale
		Insiza
		Shangani
		Mchingwe
		Upper Ngesi
	Western	Plumtree
		Marula
		Figtree
		N. Matopos
		Gwaai
		Matetsi
	Umzingwane	S. Matopos
		Gwanda
		Filabusi
		Belingwe
		Shabani
		Limpopo
Midlands	*Gwelo*	Gwelo E.
		Selukwe
		Vungu
		Upper Ngesi
		Gwelo
		Tokwe
	Que Que	Umniati-Sebakwe
		Bembezaan
		Sessombi
		Battlefields
	Victoria	Chiredzi
		Nuanetsi-Mtilikwe
		Victoria Central
		Umshandige
		Victoria E.
		Sabi Valley
	Umfuli N.	Selous
		Gadzema
	Umfuli S.	Suri-Suri
		Umsweswe
		Umfuli
		Sokis
	Charter	Gutu
		Chatsworth
		Featherstone
		Enkeldoorn
		Umvuma
Eastern	*S. Mid-Eastern*	Headlands
		Rusape
		Tsungwezi
		Odzi
	N. Mid-Eastern	Mtoko
		Nyandora
		Macheke
		Mayo
	N. Eastern	Inyanga
		Umtali N.
		Umtali S.
		Chinyika
	S. Eastern	Cashel
		Chipinga
		Melsetter

Total 100 I.C.A.s

B. NORTHERN RHODESIA I.C.A.s

Group	*I.C.A.*
Zambezi	Livingstone
	Zimba (South Kalomo)
	Kalomo North
	Choma South
	Choma North
Mazabuka	Monze-Pemba
	Magoye
	Lower Kaleya
	Upper Kaleya
	Mazabuka
	Nega Nega
Lusaka	Chilanga East
	Chilanga West
	Lusaka West
	Lusaka East
	Lusaka North
Chisamba	Chisamba East
	Chisamba West/Mumbwa
	Mwomboshi
Broken Hill	Broken Hill South
	Broken Hill North
	Mkushi
Copperbelt	Chingola-Bancroft
	Ndola-Luanshya
	Kitwe-Mufulira
Fort Jameson	Fort Jameson

Total 26 I.C.A.s

MECHANICAL PROTECTION OF ARABLE LAND

A. SOUTHERN RHODESIA

Region	Period	Contours, Ridges, Storm Drains	Bench Terrace	Irrigation Furrows	Drainage Pasture Furrows
		(miles)	(miles)	(miles)	(miles)
Mashonaland	1955–56	3,312	1	52	1
	1956–57	3,327	2	21	—
	1957–58	3,137	1	41	7
	1958–59	3,356	—	24	—
	1959–60	3,528	—	37	—
	1960–61	3,928	—	39	286·3
Midlands	1955–56	737	5	33	412
	1956–57	703	13	36	24
	1957–58	760	2	22	5
	1958–59	754	6	40	62
	1959–60	708	2	34	24
	1960–61	765	14	49	14
Matabeleland	1955–56	104	12	11	14
	1956–57	158	1	11	—
	1957–58	395	9	21	—
	1958–59	350	2	13	1
	1959–60	309	2	22	2
	1960–61	292	0·3	14	—
Eastern	1955–56	1,555	12	39	2
	1956–57	1,558	10	56	2
	1957–58	1,818	9	54	—
	1958–59	1,664	5	34	3
	1959–60	1,484	—	63	—
	1960–61	1,494	—	42	—
TOTALS	1955–56	5,708	30	135	429
	1956–57	5,746	26	124	26
	1957–58	6,110	21	138	12
	1958–59	6,124	13	111	66
	1959–60	6,029	4	156	26
	1960–61	6,479	143	144	300·3

B. NORTHERN RHODESIA

Group	Contours Distance	Storm Drains	Roads	Waterways	Irrigation Furrows
	(yards)	(yards)	(yards)	(yards)	(yards)
Kitwe/Broken Hill	88,577	3,150	14,230	—	2,400
Chisamba	33,500	59,700	10,700	19,400	900
Lusaka	97,582	24,090	62,560	8,740	10,497
Mazabuka	29,288	77,110	10,300	11,800	400
Choma	302,286	1,000	23,970	15,870	—
Kalomo	56,235	—	7,040	3,100	450
Ft. Jameson	121,233	333	840	650	—
TOTALS:					
1960–61	728,701	165,383	129,640	59,560	14,647
1959–60	860,145	98,237	306,510	45,018	22,336
1958–59	754,322	135,634	301,600	63,843	39,526
1957–58	1,175,373	100,673	399,144	50,283	102,618
1956–57	913,700	133,800	149,200	—	—

WATER CONSERVATION

A. SOUTHERN RHODESIA

Region	Period	No. of Dams	Aggregate Capacity in gallons	Average Capacity per Dam in gallons
Mashonaland	1955–56	80	621,300,000	7,766,000
	1956–57	72	399,020,000	5,542,000
	1957–58	105	473,928,000	4,513,000
	1958–59	85	605,000,000	7,000,000
	1959–60	163	1,000,499,000	6,138,000
	1960–61	133	1,648,650,000	12,396,000
Midlands	1955–56	95	464,705,000	4,892,000
	1956–57	77	781,850,000	10,284,000
	1957–58	84	253,360,000	3,016,000
	1958–59	83	552,590,000	6,657,000
	1959–60	172	1,916,960,000	11,145,000
	1960–61	180	1,471,980,000	8,178,000
Matabeleland	1955–56	153	527,300,000	3,450,000
	1956–57	142	679,200,000	4,783,000
	1957–58	133	832,000,000	6,631,000
	1958–59	208	1,435,630,000	6,902,000
	1959–60	389	2,279,000,000	5,833,000
	1960–61	287	1,729,450,000	6,026,000
Eastern	1955–56	25	34,700,000	1,388,000
	1956–57	20	100,565,000	5,028,000
	1957–58	39	23,600,000	605,000
	1958–59	37	103,000,000	3,000,000
	1959–60	54	269,650,000	5,000,000
	1960–61	72	477,530,000	6,632,000
Totals	1955–56	353	1,648,005,000	4,680,000
	1956–57	311	1,960,635,000	6,304,000
	1957–58	361	1,582,888,000	4,520,000
	1958–59	413	2,696,220,000	5,890,000
	1959–60	778	5,466,109,000	7,026,000
	1960–61	672	5,327,610,000	7,928,000

B. NORTHERN RHODESIA

	Farmer Built		*Government Built*	
Group	*No.*	*Capacity*	*No.*	*Capacity*
Kitwe/Broken Hill	3	9,250,000	1	25,000,000
Chisamba	—	—	—	—
Lusaka	3	8,500,000	3	18,500,000
Mazabuka	2	22,500,000	4	33,500,000
Choma	1	1,000,000	5	36,000,000
Kalomo	3	26,000,000	13	171,000,000
Fort Jameson	1	500,000	—	—
Totals: 1960–61	13	67,750,000	26	284,000,000
1959–60	9	46,750,000	46	512,000,000
1958–59	12	61,750,000	26	275,000,000
1957–58	17	59,290,000	41	103,000,000
1956–57	10	22,080,000	47	114,886,000

	Total Number of Dams Constructed	*Capacity (gallons)*
1960–61	39	351,750,000
1959–60	55	558,750,000
1958–59	38	336,750,000
1957–58	58	162,290,000
1956–57	57	128,966,000

APPENDIX V

FIELD TRIALS

Type	Matabele-land	Mashona-land	Eastern	Mid-lands	Northern Rhodesia	Total
Maize Variety Trials and Demonstrations	—	2	3	3	5	13
Fertilizer Trials on General Crops	—	1	7	—	3	11
Fertilizer Demonstration on General Crops	—	—	—	1	—	1
Groundnut Fertilizer/Variety Trials	—	3	1	2	6	12
Trash-farming Trial	—	1	—	—	—	1
Run-off Trial	—	1	—	—	—	1
Drainage Trials	—	12	2	4	—	18
Veld and Pasture Trials	—	2	2	1	—	5
Bush-control Trials	—	—	1	—	—	1
Cotton Variety Trials	—	—	1	2	—	3
Soya-bean Variety Trials	—	1	1	—	4	6
Gully-control Trials	—	—	—	3	—	3
Summer Wheat Weed Control Trial	—	1	—	—	—	1
Wheat Trial on Moisture Retaining Soil	—	—	—	1	—	1
Sugar-cane Demonstration	—	1	1	—	—	2
Lucerne Rotation Trial	1	—	—	—	—	1
Fruit and Vegetable Trial	—	—	1	—	—	1
Fodder Crop Demonstrations	—	4	—	2	8	14
Sorghum and Millet Variety Trials	1	—	—	1	2	4
Weed Control Trials	—	1	—	1	—	2
Fodder Crop and Sundry Demonstrations	9	1	—	10	2	22
Livestock Trials	6	2	—	5	2	15
Tobacco Fertilizer Trials	—	5	1	—	—	6
Tobacco Variety Trials	—	2	—	—	—	2
	17	40	21	36	32	146

APPENDIX VI

ADVISORY VISITS, 1st OCTOBER, 1960 TO 30th SEPTEMBER, 1961

A. SOUTHERN RHODESIA

Purpose of Visit	*Mash.*	*Mat.*	*Mid.*	*East.*	*Total*
Pegging					
1. Contours	1,753	119	369	808	3,049
2. Storm drains	51	19	40	7	117
3. Grass strips	68	4	8	7	87
4. Other (pasture furrows)	212	1	64	25	302
5. Roads and road drains	185	16	61	46	308
6. Irrigation works	59	89	135	74	357
7. Dams	741	395	411	385	1,932
TOTAL	3,069	643	1,088	1,352	6,152
Inspections					
1. Subsidy	117	178	130	51	476
2. Water Court	156	53	105	139	453
3. Roads	173	15	38	65	291
4. Timber cutting	11	2	8	4	25
5. Land settlement and Crown land	72	39	33	14	158
6. Subdivision of land	43	15	33	37	128
7. Seed	9	8	64	1	82
8. Livestock improvements	135	24	77	44	280
9. Livestock—other	205	102	120	79	506
10. Mechanical units	1,101	591	384	219	2,295
11. Miscellaneous	551	195	327	302	1,375
TOTAL	2,573	1,222	1,319	955	6,069

ADVISORY VISITS—*continued*

Purpose of Visit	*Mash.*	*Mat.*	*Mid.*	*East.*	*Total*
Advisory					
1. Field crops	1,988	337	1,284	962	4,571
2. Veld and Pasture	92	56	65	21	234
3. Livestock	512	670	723	101	2,006
4. Irrigation	178	167	246	83	674
5. Conservation	1,065	369	551	234	2,219
6. Farm planning	2,207	442	680	445	3,774
TOTAL	6,042	2,041	3,549	1,846	13,478
Meetings					
1. I.C.A. and Group	539	280	368	218	1,405
2. Farmers' Association meetings	149	76	120	84	429
3. Staff	350	164	141	137	792
4. Miscellaneous	253	128	128	138	647
TOTAL	1,291	648	757	577	3,273
Other Visits					
1. Research Stations	221	64	88	103	476
2. Farmers days	359	149	208	174	890
3. With committees	181	79	90	241	591
4. With specialists	507	157	228	195	1,087
5. Miscellaneous	1,821	407	454	242	2,924
6. Field trials	489	267	428	227	1,411
TOTAL	3,578	1,123	1,496	1,182	7,379
GRAND TOTAL	16,553	5,677	8,209	5,912	36,351

B. NORTHERN RHODESIA

Meetings and Courses Attended	1959–60	1960–61
1. I.C.A. and Group Committees	347	378
2. Farmers' Associations	61	51
3. Road Board	16	18
4. Staff-Groups and Regional	158	256
5. Agricultural Land Boards	17	14
6. Young Farmers' Clubs	31	44
7. Miscellaneous	281	261
8. Natural Resources Board	56	48
9. Land Board	27	22
10. F.D.A.B.	79	113
11. Courses	85	152
Inspections and Visits		
1. Regional planning	626	624
2. Other conservation subsidies	52	101
3. Water Board	69	122
4. Agricultural Land Board	338	84
5. Livestock improvement scheme	509	362
6. Cattle Bank	65	9
7. Dairy bonus	1	17
8. Land Bank	23	59
9. Seed Association	117	40
10. Tobacco Grading Sheds	41	22
11. Pest control	14	46
12. Miscellaneous	446	559
13. Visits with committee members	109	157
14. F.D.A.B.	378	585
15. With V.I.P.s	305	329

Advisory		
1. Regional planning	981	525
2. Farm planning	137	198
3. Extension	2,138	2,070
4. Pegging	721	459
5. With Irrigation Officer	69	68
6. Irrigation layouts	156	115
7. Mechanical units	518	771
8. Experimental stations	301	371
9. Field days	310	228
10. Road Boards, etc.	98	87
11. Tobacco, advisory	1,636	1,322
12. Miscellaneous	351	342
TOTAL	11,667	11,029

APPENDIX VII

PLANS COMMENCED DURING THE THREE-YEAR EXPERIMENTAL PERIOD ENDING 30th JUNE, 1957

Area and Plan Name and Number	*Acreage*	*Commencement Date*	*Completion Date*
Upper Kaleya (Upper Kaleya/2)	7,728	1.6.54	31.5.58
Upper Kaleya (Middle Kaleya/4)	57,884	1.6.54	31.5.58
West Lusaka (Cheta River/1)	31,121	1.9.54	31.8.58
West Lusaka (Chingola/3)	61,008	1.9.54	31.8.58
Northern Broken Hill (North Broken Hill/5)	110,161	1.5.55	31.10.58
Lower Kaleya (Lower Kaleya/6)	70,124	1.8.55	31.7.58
East Lusaka (Chalimbana/7)	100,729	1.7.56	30.6.58
Mazabuka (Mazabuka/8)	116,987	1.10.56	30.9.59
TOTAL	555,742		

In addition to the above 10,053 acres were planned in 1952–53 in the Upper Kaleya Pilot Scheme, bringing the total acreage up to 30th June 1957 to 565,795.

PLANS COMMENCED SUBSEQUENT TO THE 30th JUNE 1957 UNDER THE OLD FEDERAL CONDITIONS

Area and Plan Name and Number	*Acreage*	*Commencement Date*	*Completion Date*
North Kalomo (Mukwela/10)	40,491	21.1.58	20.1.61
South Broken Hill (Munga River/11)	41,116	21.4.58	20.4.61
Zimba (Bowood East/9)	68,150	5.8.58	4.8.61
TOTAL	149,757		

PLANS COMMENCED SUBSEQUENT TO THE 30th JUNE 1957 UNDER NEW FEDERAL CONDITIONS UP TO 30th SEPTEMBER 1959

Area and Plan Name and Number	*Acreage*	*Date Approved*
West Lusaka (Molendemo N.W./12)	21,264	30.10.58
South Choma (Sibanyati/24)	30,000	15.1.59
North Lusaka (Lower Chongwe/50)	72,000	30.5.59
Monze-Pemba (Kazangula/33)	45,000	30.6.59
Magoye/Lower Kaleya (West Kaleya/39)	26,258	20.6.59
Livingstone (Matesi/15)	48,376	19.6.59
Mwomboshi (Miswa/56)	50,000	21.8.59
Livingstone (Maramba/14)	68,746	31.7.59
South Broken Hill (Nyama West/58)	64,132	4.9.49
Nega Nega (Lusito/40)	29,102	31.10.59
East Chisamba (Malo/54)	51,537	15.11.59
TOTAL	506,415	

PLANS COMPLETED FROM 1st OCTOBER 1959 TO 30th SEPTEMBER 1960 UNDER NEW FEDERAL CONDITIONS

Area and Plan Name and Number	*Acreage*	*Date Approved*
North Choma (Upper Mbabala/27)	56,920	20.5.61
Chilanga (Lilayi/45)	71,900	22.2.61
West Chisamba/East Wangwa/52)	78,381	1.12.60
Zimba (Bowood Luezi/17)	102,834	9.5.60
North Kalomo (Kalomo/21)	82,501	2.5.60
Monze-Pemba (Demu/31)	46,770	1.3.60
Magoye (Magoye/37)	79,043	24.9.60
West Lusaka (Molendemo West/46)	50,856	1.8.60
East Lusaka (Mwanza/48)	53,808	22.7.60
East Chisamba/Upper Chongwe/53)	37,711	20.7.60
South Broken Hill (Nyama/57)	49,402	11.8.60
West Chisamba	73,802	3.12.60
TOTAL	783,928	

PLANS COMPLETED SUBSEQUENT TO THE 30th SEPTEMBER 1960 UNDER NEW FEDERAL CONDITIONS

Area and Plan Name and Number	*Acreage*	*Date Approved*
Chilanga (Dem/44)	91,670	12.6.61
Nega Nega (Nega Nega/41)	154,767	29.4.61
North Kalomo (Mwemba/20)	129,784	15.6.61
Livingstone (Sinde/13)	20,400	Not yet approved
Monze Pemba (Monze/36)	89,861	20.5.61
North Lusaka (Ngwerere/49)	46,353	11.9.61
South Choma (Tara Batoka/30)	129,900	28.9.61
Upper Kaleya (Mbaya/38)	34,317	Not yet approved
TOTAL	697,052	

PLANS IN THE PROCESS OF BEING WORKED ON

Zimba (Ngwesi/18)
North Kalomo (Chilesha/19)
North Choma (Sibanyati West/26)
North Choma (Mbabala/28)
North Choma (Sikalonga North/29)
Monze-Pemba (Chisekesi/34)
Chilanga (Shimbabala/43)
West Lusaka (Chunga/47)
West Chisamba (Lower Wangwa/51)
Mwomboshi (Mulembo/55)

REPORT OF THE DIRECTOR OF VETERINARY SERVICES
for the Year Ending 30th September 1961

G. J. CHRISTIE, *Acting Director of Veterinary Services*

THE DEPARTMENT OF VETERINARY SERVICES operates with three branches — Field, Research, and Trypanosomiasis and Tsetse Control. The annual reports of the Assistant Directors in charge of these branches are given in full.

The amalgamation of the Veterinary Department and the Department of Trypanosomiasis and Tsetse Control took place during the year under review and has proved to be extremely satisfactory.

STAFF

Professional staff in all three branches proved extremely difficult to maintain. As far as the Veterinary staff were concerned, we completed the year with eight vacancies out of a staff of 39. Seven of the vacancies had been created by resignations, only one of the officers remaining in the country. The remaining vacancy was created by the death of Mr. Ian Walker, following an unfortunate accident while on duty.

In spite of repeated advertisements, increased starting salaries and short-term contract offers, we have been unable to fill any of these vacancies this year with new recruits. Two have, however, been filled by previous members of staff on a short-term contract basis. The outlook for next year is improved by the probable addition of at least two new men, of whom one will be on contract for four years.

At the Laboratory, three new research posts which had been created have not yet been filled.

The Trypanosomiasis and Tsetse Control Branch is similarly situated as far as professional staff is concerned.

It is becoming very obvious that our best method of obtaining staff is by the provision of bursaries to Rhodesian students, who are more likely to be attracted back to Rhodesia to make Government service a career than men from areas where our conditions are strange and unknown.

The enlargement of the staff to include African veterinarians is becoming a matter of increasing importance. Unfortunately, lads interested in this profession with university entrance qualifications have not yet come forward.

The difficulties of staff shortages were increased by the demands made on staff by disease outbreaks during the year and in many cases staff had to undertake continuous long periods of foot-and-mouth duty under extremely trying conditions.

Mr. J. MacKinnon, Director of Veterinary Services, was awarded an F.A.O. fellowship and left for the United States of America in August 1961 to undertake a five-month study course there and in Great Britain on recent advances in disease control administration.

Mr. J. B. Condy, of the Research Branch, spent approximately six months studying parasitology in Australia on an F.A.O. fellowship.

The generosity of F.A.O. in granting the above fellowships is greatly appreciated and the rewards which accrue to us from such visits are well recognized. It is only by such visits that benefits obtained by modern scientific advances can be realized to the full, appreciated, and attempts made to adapt them to our own environment.

GENERAL

Generally speaking, the disease position, with the exception of foot-and-mouth disease, was favourable. The extension of the rains by late showers in May and June had a beneficial effect on the grass, so that by August and September the condition of stock was unusually satisfactory.

The rising tide of supplementary feeding with cubes, urea blocks, etc., have no doubt contributed towards this position.

FOOT-AND-MOUTH DISEASE

As reported in 1959–60, we entered this year with an existing outbreak in the Nata Native Reserve. Due to existing conditions of drought, poor condition of the

cattle, etc., the aphthisation of this area had to be postponed until January 1961. In the mean time, the disease had smouldered there under cordon. The final outbreak of disease in this area was in July 1961. There is no doubt that this situation, where periodic outbreaks occurred in this area throughout the year, was conditioned by the long period which had to elapse before the Nata North Reserve was aphthised.

Further to the south, along the Bechuanaland border on the Ramaquabane River, a series of outbreaks was confirmed from Plumtree to the Shashani River. These were associated with game movements and illegal cattle movements on the Bechuanaland border. Progressive break-backs occurred in spite of intensive staff patrol work until the disease had penetrated close to the Matopos National Park.

The assistance given by the Army and the Police to man the very extensive cordon was much appreciated.

It is evident from the report of the Assistant Director of Veterinary Services (Field) that a large part of the successive breaking-back of the disease was due to illegal movements of stock and transport of meat; in addition the civil disobedience campaign added to our difficulties.

It was extremely disheartening to staff having to work long hours under tough conditions to realize that too often their efforts to control this disease, which threatened to wreck our cattle economy, could be set at nought by the deliberate evading of controls by individuals who set their own selfish interests above the needs of the majority, as well as by the persistent refusal to co-operate by a body of the community at the instigation of advisers whose chief interest lay in hindering the implementation of a rational policy rather than benefiting their fellows.

From Nata Reserve to Matshetse Special Native area, the most easterly point in this outbreak, all the disease proved to be due to type S.A.T. I.

In May 1961, an outbreak occurred in the Nuanetsi area at Malapati dip in the Nuanetsi River. This proved to be S.A.T. II in type and was thought to be associated with game movement across the eastern border of the country. The outbreak was uncomplicated and restrictions were lifted in September 1961.

TUBERCULOSIS

A study of the figures of tested cattle would suggest that we have reached the peak of testing of dairy herds under present conditions. Without some direct incentive to the dairy farmer we are unlikely to progress further, as those not yet in the scheme have been subjected to considerable propaganda during the past few years and will obviously not be induced to enter the scheme unless some fresh stimulus is offered.

The low figure of reactors, 0.45 per cent. over 98,545 tuberculin tests, gives an indication of the actual incidence of disease. Only 25.7 per cent. of reactors showed lesions at post mortem examinations. The comparative intradermal test is employed because of the presence of "non specific" reactors but it is of interest to record that neither avian tuberculosis nor Johne's disease are responsible, but "skin" tuberculosis has been recognized as occurring.

INFERTILITY DISEASES

Considerable attention has been paid to this group in the last few years.

Contagious Abortion, because of the relative ease with which it can be controlled by the use of S19 vaccine and the fact that conditions in this country mitigate against rapid spread, is not regarded by farmers and ranchers with the seriousness it deserves. Too often, especially in ranch-type herds, or herds where good management practices are minimal, there is an insidious spread of disease over a number of years before investigation into losses is undertaken.

Epivaginitis continues to decline in importance, no new centres having been discovered during the year.

Only 13 premises now remain under restrictions.

Vibriosis. A further 11 premises were discovered to be infected during the year; control was obtained in most cases by the use of A.I. plus treatment with antibiotics.

Trichomoniasis. One outbreak was discovered during the year. It is very doubtful if this condition is at all widespread.

Considerable work is being undertaken at the Laboratory to develop a tampon test so that a serological test can be used in the diagnosis of this condition. All tampons are already being checked for contagious abortion and vibriosis.

Surevy. It was found that the survey, initiated by the Agricultural Research Council into the causes of low fertility in ranch cattle in the Federation, was not practicable as initially conceived, because of the disease position and lack of staff, and even a pilot scheme which was commenced, involving relatively few farms, was found to have many operative difficulties.

Artificial Insemination. All three centres, namely Salisbury, Gwelo and Bulawayo, continue to be operated with deep-frozen semen imported from the Republic of South Africa, very satisfactory results being obtained.

The general dairy farmer reaction, however, has proved extremely disappointing. It was thought at one time that the calibre of the bulls in use was a major factor restricting progress. However, no vast improvement in use has followed the switch-over to deep-frozen semen, a procedure which gave farmers access to some extremely good bulls standing at the Irene A.I. centre in South Africa. In addition, the response to the importation of semen from proven Friesland and Jersey bulls in the United Kingdom failed to stimulate any enthusiasm in the great majority of A.I. users. Advice and assistance has been given to the Department of Native Affairs in connection with the development of an A.I. centre at a research station in the Hartley district, involving the use of indigenous bulls.

Rabies. Owing to pressure of foot-and-mouth duties, we were unable to carry out our planned vaccination campaigns. The effect is clearly seen in the vaccination figures for the year; 83,818, as compared with 141,959 for the previous year.

Fortunately, our previous vaccinal cover was sufficiently effective to clamp down possible outbreaks; only seven positive cases were recorded this year, all in border areas. As soon as conditions permit, the backlog of vaccinations will be reduced, as it is only by persistent vaccination of our dog population that we can achieve the necessary protection. Indications at present are that the disease has not become endemic in our smaller carnivora, as has occurred in other countries where rabies occurs.

Trypanosomiasis. With the advent of better methods of administration of some of the more recent residual insecticides and better trypanocidal drugs, there has been a gradual switch from the game destruction method of control to spraying of selected areas and the maintaining of cattle in infested areas by chemotherapy. Whatever the method by which it is achieved, control of tsetse-fly can only be maintained by occupation of the land and the cost today is such that it must be land worth occupying.

In common with foot-and-mouth disease control trypanosomiasis work has also suffered setbacks because of the civil disobedience campaign.

The development of a small research station at Lusulu in the central Binga area this year is considered to be an important step having great potential.

It is intended to study the effect of various chemotherapeutic régimes in cattle, sheep and pigs under conditions of natural challenge.

This work, combined with investigations under artificial challenge at the Laboratory in Salisbury, should provide us with information useful to and necessary for the successful settlement of those areas presently under attack.

Ticks and Tick-borne Disease. The importance of effective tick control on our cattle economy can never be over stressed, as it is the foundation cornerstone.

In spite of the multiplicity of selection of tickicides and the possible risks from arsenical poisoning, by far the larger proportion of our farmers favours arsenic in the dip bath. It has been repeatedly shown on many occasions that regular dipping is the best method of controlling such diseases as red-water, gallsickness, theileriosis, etc., and that when breakdowns do occur with these diseases assuming a decimative character the fault invariably lies in ineffective dipping.

The University College of Rhodesia and Nyasaland is at present undertaking studies in the bionomics of tick life with a view to intensifying control of these parasites.

Avian Encephalomyelitis — "epidemic tremor" — was recorded in March 1961 for the first time in Southern Rhodesia on two poultry farms practically simultaneously but no connection could be established between the two outbreaks, nor has any definite source of origin been determined.

Unfortunately, both farms were exporters of day-old chicks, so that affected chicks had been exported to other African territories before the condition was diagnosed.

No further outbreaks have been recorded.

Specific Infectious Epididymitis of Sheep. This condition, which can be serious because of reduced lamb crop, was diagnosed on several properties. It is proposed to prohibit the importation of all rams which cannot be certified as free.

CONFERENCES

The Director, in company with the Assistant Director of Veterinary Services (Field), attended a meeting in Pretoria on foot-and-mouth disease and in Lourenço Marques on trypanosomiasis, in company with the Assistant Director of Veterinary Services (Tsetse and Trypanosomiasis Control).

A meeting of I.B.A.H. took place at Victoria Falls, when the Federation was the host territory, and the Director and both A.D.V.S. (T. and T.C.) and A.D.V.S. (R.) attended.

The Director paid a short visit to Italy and Britain during the year in connection with the meat export trade.

A.D.V.S. (F.) attended an F.A.O./W.H.O. Zoonoses Symposium at Nairobi.

ACKNOWLEDGEMENTS

The staff of the Department are to be congratulated on the manner in which they conscientiously carried out their duties, especially those associated with foot-and-mouth disease and trypanosomiasis, often under conditions relatively dangerous to personnel, and they have succeeded in maintaining the high standard of efficiency of which the Department is justly proud.

Appreciative thanks are extended to all those departments, both Federal and Territorial, who have co-operated with the Department throughout the year.

ANNUAL REPORT OF THE ASSISTANT DIRECTOR OF VETERINARY SERVICES (FIELD)

for the Year Ending 30th September 1961

T. LEES MAY, *Assistant Director of Veterinary Services (Field)*

STAFF

THE FIELD ESTABLISHMENT of 30 professional officers had eight vacancies at the end of the year, with the post of Meat Inspection Officer being temporarily filled by a veterinary surgeon on a six months' contract.

During the past 12 months there were three resignations and one veterinary surgeon was tragically killed in the performance of official duties.

Despite expansion of salary scales for the present staff and more attractive scales for new junior officers, it became more difficult to retain present staff and virtually an impossibility to recruit any new staff.

Sub-stations had to be closed down at Que Que and Enkeldoorn and it is to be hoped that this is only a temporary phase of retrenchment.

With the increasing animal industry, the demand for expansion of veterinary services in every branch is marked and must be met and maintained.

Private practitioners have again increased and now total 35 within the country.

Competition is increasing the service to farm animals near major towns, but many ranching districts still have to rely on the depleted Government veterinary staff, with resultant overburdening of individual officers, especially in the sub-stations.

Animal Health Inspectors

The year opened with three and closed with one vacancy.

New appointments	9
Superannuations	2
Resignations	5
Transfers	Nil
Discharges	Nil

Owing to the continuous outbreaks of foot-and-mouth disease throughout the year, the lay staff were under heavy pressure and subjected to long periods of detached duties in remote areas under trying physical and mental conditions.

Many tasks outside their usual sphere of operations, in the shape of emergency roadmaking and fence erection, were undertaken successfully without demur.

Temporary lay staff had to be engaged towards the end of the year to supervise cordons, etc., but the unsatisfactory character and undependability of this type of staff underlines the necessity of having sufficient trained permanent staff to be able to deal with disease emergencies without exposing control to such hazards.

Meat Inspection

Again it was found impossible to maintain the staff establishment of 15 Meat Inspectors.

With the impending opening of the Colcom bacon factory, which will demand the detachment of two meat inspectors from other centres, the position will be materially worsened.

The year closed with two vacancies.

Duties were satisfactorily performed at the Cold Storage Commission abattoirs at Bulawayo, Salisbury, Fort Victoria and Umtali.

The continuance of the manufacture of goods by Messrs. Liebig's factory, West Nicholson, from frozen, dressed-meat supplied by the Cold Storage Commission abattoirs, Bulawayo, amply aided in coping with the shortfall of staff.

The acceptance of a six-month contract appointment by Mr. H. Thornton, a world authority, as Meat Inspection Officer, came as a stimulating surprise to all staff and will be of major worth to the emerging meat industry.

Accommodation

No new housing was erected and total staff accommodation remained at 34 houses.

Transport

The permanent establishment continued to operate private transport despite rapidly rising costs. The heavy wear and tear on vehicles in remote areas without roads, during the foot-and-mouth disease campaigns, entailed much additional expense and it is evident that a review of the mileage allowances should be made to meet extra costs when staff have to operate private transport under such conditions.

GENERAL

Climate, Food and Water Supplies, and Condition of Stock

Early in the year, drought persisted in parts of the Midlands and the south-west region of the country. Storms in early October were followed by general widespread soaking rains in November. Thereafter, the overall pattern of rains was excellent, with steady recurrent falls throughout the season, ideal for crops and grazing, extending well into April, with odd heavy showers in May and June.

Most districts characterized the agricultural year as an excellent one, with record crops of maize, beans and tobacco, prolonged growth of grass well into winter and a very satisfactory persistence of surface and running water at a high level. Underground water levels improved, with many dry boreholes coming back into supply.

Reaping of many crops was handicapped by persistence of rain and the winning of hay, veld, bean, etc., was consistently baulked in several areas.

Grazing was superior to that of recent years, with the exception of the drought-stricken areas, where aridity had led to death of perennial grasses and the early growth was mostly of weeds, mopani and transient annual grasses. Later browse flush helped to maintain condition therein but bush encroachment was marked. Excellent crop residues created general stock improvements in winter.

In the Midlands, early bolting of perennials led to sharp falls in nutritional planes and a prolonged, cold winter adversely affected the general condition of stock.

Overall, the majority of stock did extremely well on veld grazing and a marked increase in supplementary feeding on the veld and finishing of steers in pens exemplified the rising interest in better beef production. Late rains minimized veld fires.

By August and September, general condition of most stock was well above average.

Practically every district has recorded a rising interest in beef cattle as investment factors, with keen interest in proper management and earlier marketing, which bodes well for the future.

Record crops in tribal areas with little need for money has adversely affected cattle sales therefrom and many sales were cancelled due to lack of entries. Taken together with the closure of sales in many tribal cattle-producing areas, due to foot-and-mouth disease, these factors have restricted the forward flow of store cattle, especially to ranchers, which we can ill afford at this juncture.

In Bulalima-Mangwe, South Matobo and Gwanda native districts, poverty deaths following the 1959–60 drought had been assessed at 40–50,000 head. Following the rains, many cattle, abandoned on distant river fronts and written off as dead, returned to their kraals and the figures of mortality can be assessed at approximately 25–30,000 head only. Most survivors were of the two- to three-year-old class and main deaths were in old cows and oxen.

Attention has again been drawn to the limited weight gains of tribal-owned stock in the flush season, due to kraaling for most of the day. With more and more tribal children attending school, the effects of kraaling for excessive periods must become markedly deleterious to the cattle economy.

Tick-life and Dipping

Reasonable control of ticks on a widespread basis is reported but, following the detachment of staff for long periods on foot-and-mouth disease control, it is generally observed that cattle owners tend to neglect dipping in the absence of regular official supervision and rely on expensive organic dipping material to clean

up cattle when inspections are required, or when cattle are being marketed. Unannounced inspections by staff have confirmed this fact and the future outlook in regard to tick control cannot be regarded as satisfactory. With such practices, it is only a question of time for the creation of tick-infested veld and a subsequent increase in tick-borne diseases.

Phosphatic dips have gained a firm hold in Mashonaland and the Midlands, especially in regard to blue *(Boophilus)* tick control and other species have been controlled by the necessarily combined arsenical dip.

Toxaphene (chlorinated camphene) is widely employed in North Mashonaland and Manicaland to control Rhipicephalid species (brown- and red-legged). Its use in the lowveld to control bont *(Amblyomma* sp.) and bont-legged *(Hyalomma* sp.) has led to a major build-up of the blue *(Boophilus* sp.) in areas where heretofore arsenical dipping completely controlled it.

The statement can only be reiterated and it is deplored that so many cattle owners resort to costly organic dips to control ticks that could be cheaply controlled by regular sustained dipping in arsenical dips. Switches are made from one organic preparation to another to solve problems created by lack of regular dipping and the vague knowledge of many cattle owners as to exactly what products have been added to dip-tanks is a considerable hindrance in diagnosis of the cause and the eradication of persistent tick infestations, to their own loss. The multiplicity of trade names, even in dips sold by the same manufacturer, adds considerably to the confusion of these artificially created problems.

Quarantine Notices (Tick Infestations)

Veterinary Districts: Bulawayo, 90; Salisbury, 210; Fort Victoria, 172; Gwelo, 235; Umtali, 69; Chipinga, 104; Sinoia, 81; Gwanda, 35.—Total, 996.

Contraventions

	Bulawayo	Salisbury	Fort Victoria	Gwelo	Umtali	Chipinga	Sinoia	Gwanda	Total
Animal Health Act	206	—	114	—	1	211	—	102	634
Animal Health Regulations	419	85	54	123	360	7	5	254	1,307
Public Order Act	—	4	—	—	1	2	—	—	7
Cruelty Act	2	2	11	—	2	1	—	—	18
Stock Theft Act	—	—	2	—	1	—	—	—	3
TOTAL	627	91	181	123	365	221	5	356	1,969

Livestock Inspections

The total number of cattle inspected by members of the staff during the year, under the Animal Health Act, was 21,640,911.

SPECIFIED DISEASES

VIRAL AND RICKETTSIAL DISEASES

Foot-and Mouth Disease

Nyamandhlovu Native District. Infection had been previously diagnosed in Nata North Native Reserve, due to contacts on rivers through drought, with the infected Nata South Cattle (1959–60).

Immediate virusing was impossible, due to drought poverty, etc., with resultant spreads as follows:

Property	*Cattle*	*Per Cent. Virus Reaction*	
Nata North Native Reserve	46,009	27	Re-virused nil return
Samanene Native Purchase Area	1,563	95	
Luchabi Ranch	1,332	90	

All samples type S.A.T. 1, with which Nata North had been virused in 1957. No infection was found in small stock.

Freed of all restrictions on 14th July 1961.

Bulalima-Mangwe Native District. Spreads in the north from Nata South and Nata North Native Reserves were—

Property	*Cattle*	*Per Cent. Virus Reaction*	*Type*
Tegwane Mission	511	85	S.A.T. I.
Holmwood	389	84	,,
Cromartjie	65	100	,,
Mtoli	181	80	,,
Sandown	2,852	95	,,

In the south of this district, because of the drought, many cattle had been moved on to river fronts on the international boundary, making contact with widespread infection in Bechuanaland Protectorate. The position deteriorated with illegal return movements of such cattle, straying and game infection throughout the area with the following spreads:

Property	*Cattle*	*Per Cent. Virus Reaction*	*Type*
Special Native Area "C"	12,074	90	S.A.T. I.
M'phoengs Native Reserve	8,413	95	,,
Brunapeg Native Purchase Area	1,953	87	,,
Blackwater	643	90	,,
Crown	644	95	,,
Warmley	540	95	,,
Lewisdale	303	98	,,
Thornville	1,293	88	,,
Shesha Mangwe	187	80	,,
Raditladi Native Reserve	4,604	88	,,
Ramaquabane Native Purchase Area	4,296	89	,,
Zimyana Native Purchase Area	4,751	90	,,
Avoca	29	90	,,
Manifest	118	90	,,
Grasskop	143	90	,,
Chantrey	383	90	,,
Ryecroft	315	90	,,
Fallowfield	501	90	,,
Romney	315	90	,,
Mansfeldt	44	90	,,
Castle Block	3,257	95	,,
Ingwesi	1,316	95	,,
Home	712	95	,,
Marshlands	238	90	,,
Wilfred's Hope	205	92	,,
Despatch	1,212	80	,,

The year ended with most of the district in quarantine.

The same major drought evacuation and contacts to the south, as in Bulalima-Mangwe, gave rise to similar spreads amongst cattle in Matobo, Gwanda and Beitbridge Native Districts as follows:

Matobo Native District

Property	*Cattle*	*Per Cent. Virus Reaction*	*Type*
Dube	700	90	S.A.T. I
Sidube	1,704	95	,,
Naseby East	1,437	92	,,
Semokwe Native Reserve	17,544	92	,,
Seear Block Native Purchase Area	2,305	82	,,
Mambali Native Purchase Area	2,469	84	,,
Maribeha Native Purchase Area	2,695	88	,,
Ratanyana Native Purchase Area	1,156	85	,,
Special Native Area "C"	3,159	89	,,
Mt. Sibala Native Purchase Area	566	97	,,
Shashani Native Reserve	5,002	86	,,

Spreads into 20 small ranches lying to the north of the infected native areas occurred between May and August, involving the virusing of 8,359 cattle with percentage virus reactions of 85–96. Poor fencing, absentee owners, scattering of herds by carnivora and heavy infection in a large game population were all contributory factors to spread, despite extensive cordons.

These spreads all typed as S.A.T. I.

The majority of this district was still in quarantine at the end of the agricultural year.

Gwanda Native District

Property	*Cattle*	*Per Cent. Virus Reaction*	*Type*
Gwanda Native Reserve	9,630	95	S.A.T. I
Special Native Area "D"	22,049	90	,,
Tuli Native Purchase Area	1,172	93	,,
Special Native Area "A"	15,057	88	,,
Matchetoke Special Native Area	13,533	90	,,
Ranches			
Oakley Block	2,200	90	,,
Georgia	1,477	90	,,
Corner	1,176	90	,,
Shoka	132	90	,,
Tuli River	410	90	,,
Mt. Orquiel	674	90	,,
Sheet and Blanket	1,068	90	,,
Mt. Hampden	97	90	,,
Hotel	293	90	,,
Sweet Water	243	90	,,
Vubachikwe	316	90	,,
Insindi	5,094	90	,,
Longueville	1,369	90	,,

Civil disobedience in the native areas, plus cattle speculation, absentee landlords, sub-standard fencing and poor cattle control necessitated the strictest handling in this area. A quadruple depth cordon of Army, Police and Veterinary units was erected, but even this did not stop all spreads, despite road blocks plus night and day patrols. The only infection of small stock with S.A.T. I was found in pigs in this area.

Beitbridge Native District. Straying from an infected adjoining dip tank area in Special Native Area "D", Gwanda Native District, gave a small, easily controlled spread in Special Native Area "D", Zone 2, involving 3,683 cattle. Type was again S.A.T. I and virus reactions were 80 per cent.

Filabusi Native District. Extensive contacts had been made on the Umzingwane River with infected cattle from Matshetshe Special Native Area, Gwanda Native District, involving the following:

Property	*Cattle*	*Per Cent. Virus Reaction*	*Type*
Special Native Area "B" and Insiza Native Reserve:			
Zhlube	2,138	90	S.A.T. I
Sibasa	1,057	94	,,
Kalanke	1,423	96	,,
Mzingwane	1,038	94	,,

No further spreads occurred in the district.

Nuanetsi Native District. In May, 1961, the disease was confirmed at Malapati Dip, in the same kraal as 1957, which is situated at a common migratory game haunt, Buffalo Bend, on the Nuanetsi River.

6,133 cattle, 1,235 sheep and 2,627 goats were virused. Type samples proved to be S.A.T. II and small stock were found infected. Satisfactory containment was effected by cordon and all restrictions were withdrawn in September 1961.

GENERAL

In all, a total of 238,231 cattle, 2,627 goats and 1,235 sheep had been subjected to virusing, with a major part of Matabeleland under quarantine for most of the year.

Drought conditions, followed by heavy rains, added materially to the difficulty of handling the overall outbreak, plus a tribal population reluctant to leave their kraals later in the year, as they had one of the best crops for years.

Tribute must be paid to the responsible District Veterinary Officers and Animal Health Inspectors for their unflagging energy and endless extra hours of work in roadmaking, fence erection, etc., under the most trying conditions in remote areas, in the establishment of cordons for cattle control. Without such devotion to duty there would have been little hope of containing these outbreaks.

Rabies

The following cases were confirmed during the year:

Native District	*Number of Cases*	*Date of Last Case*	*Species*	*State of Vaccination*
Bulawayo	1	30.11.60	Dog	Unvaccinated
Kariba	1	13.2.61	Dog	Unvaccinated
Matobo	1	5.7.61	Dog	Vaccinated
Mtoko	1	3.8.61	Dog	Unvaccinated
Nyamandhlovu	1	21.10.60	Dog	Unvaccinated
Umtali	2	14.8.61	Dogs	Unvaccinated

Results according to species: Dogs, 7 positives.

Seventy-eight specimens were examined by the laboratory during the year.

This brings the total number of positive cases since the first outbreak to 915.

The declining incidence still reflects the effectiveness of mass vaccination enforcement.

Year	1954	1955	1956	1957	1958	1959	1960	1961
Specimens—Submitted	474	264	181	208	165	117	112	78
Positive	183	100	54	50	41	28	15	7

For the second continuous year since the original outbreak in 1950, no cases were recorded in feral animals.

Positives were again confined to districts on the borders of adjoining territories where mass vaccination is not in vogue. The positive vaccinate had only been vaccinated once in 1958 and had not been brought up for the second booster vaccination required by legislation. The other positives were all unvaccinated stray dogs.

A clinical case was reported in a native child at a mission in the Chipinga Native District from a kraal on the Rhodesian Border. No history was available, nor were any specimens submitted.

Two dog specimens from a border area adjoining the Umtali Native District were examined for the Moçambique authorities and found to be positive.

Only 50 unvaccinated dogs were destroyed this year and prosecutions in regard to non-production of dogs for vaccination fell to 87 c.f., 309 destructions and 320 prosecutions in 1959–60.

The production of dogs within the tribal areas, for checking as to the state of vaccination, and for vaccination, was extremely poor, largely due to political reasons.

In addition, the protracted absence of staff (on foot-and-mouth duties) from their normal districts, materially added to the shortfall of animals vaccinated.

The total of vaccinations, 83,818 only, reflected the deterioration of the position in comparison with 141,959 vaccination in 1959–60.

Vaccinations with Lederle's Flury Strain vaccine since July 1951 now total 1,223,441.

The production of dogs in the European areas for vaccination has been sustained by every available avenue of publicity, including television, but it is obvious that in the illiterate tribal areas a planned programme of audio-visual aids will be required to ensure continuance of the necessary vaccinal cover.

Contagious Epididymitis and Vaginitis

No new centres of infection were disclosed despite a country-wide check on all bulls and examination of any suspicious discharging cows.

Pressure for eradication is being maintained on the hard core of infection on the large ranches, but co-operation is difficult to secure in the light of the insignificant economic effect of the chronic form of this condition with the resultant herd immunity.

Eight premises were released from quarantine, reducing the total to 13 premises under restrictions.

Lumpy-skin Disease

Only one severe outbreak occurred in the Salisbury District, which was soon controlled with the Onderstepoort vaccine.

Elsewhere, mild sporadic incidence of no economic significance was reported.

BACTERIAL DISEASES

Anthrax

No new centres were diagnosed.

(a) Gazetted Anthrax Areas — Annual Vaccinations:

District	*Cattle*	
Lupane	54,695	Third and Final inoculation
Que Que	3,515	
Bubi	48	
Matobo	262	Second annual inoculation
Wankie	998	
TOTAL	59,518	

(b) The prophylactic inoculation of stock in the Victoria and Beitbridge Native Districts in 1959–60, as a barrier against spread from the Kruger Park outbreak in antelope, yielded a successful cover.

Tuberculosis

(a) Imports tested, 503 cattle; reactors, 1.

(b) Exports tested, 645 cattle, reactors, nil; 1 pig, reactors, nil.

Tuberculin Herd Tests

(c) *Old Voluntary Scheme:*

Veterinary District	*No. of Herds Under Test*	*No. of Cattle Under Test*	*No. of Reactors 1960–61*
Salisbury	45	3,060	—
Bulawayo	33	3,365	—
Umtali	19	1,230	—
Gwelo	8	819	—
Chipinga	1	56	—
Sinoia	—	—	—
TOTAL	106	8,530	—

(d) *Compensation Scheme:*

Veterinary District	*No. of Herds Under Test*	*No. of Cattle Under Test*	*No. of Reactors 1960–61*
Salisbury	192	18,380	23
Bulawayo	56	5,441	—
Umtali	44	4,158	—
Gwelo	20	1,954	4
Chipinga	26	1,660	—
Sinoia	14	1,233	2
Gwanda	5	555	—
Victoria	26	1,924	—
TOTAL	383	35,305	29

(e) *Voluntary Scheme* (Beef Herds):

Veterinary District	*No. of Herds Under Test*	*No. of Cattle Under Test*	*No. of Reactors 1960–61*
Salisbury	6	4,882	—
Bulawayo	1	140	—
Sinoia	2	163	1
TOTAL	9	5,185	1

Summary: Agreement Testing

Dairy Herds

Total number of herds under test	489
Total number of cattle under test	43,835
Total number of reactors, 1960–61	29

Beef Herds

Total number of herds under test	9
Total number of cattle under test	5,185
Total number of reactors, 1960–61	1

Fifty-three new herds were enrolled under the compensation scheme.

Twenty herds ceased testing, mostly being dispersed on sale and added to herds already under test.

This represents a gain of 33 herds.

Calculated to the latest census figures of European-owned dairy cattle (109,651), we are only testing 40 per cent. of the dairy cattle. There is very little chance of increasing this under present conditions unless some incentive, distinct from our compensation scheme, can be offered to the milk producer.

Of the 489 herds under test, 337 attained full attested status with long-term testing.

Incidence of reactors continues to decline with the customary increase in "No visible lesions" on post mortem examination. Lesions of tuberculosis were found in only 25.7 per cent., compared to 36.7 per cent. and 50 per cent. in the two previous years.

For various reasons, 5,729 head were tested, without agreement schemes, with no reactors.

The annual test on a large ranch in Matabeleland again gave encouraging results. 39,610 head were tested and only 315 reactors were found. At the request of the management, the calves were not tested.

Ranch incidence, therefore, is as follows:

Year	1958	1959	1960	1961
Reactors, per cent.	1.19	1.13	0.53	0.79

If the calves had been included in the test — these being excluded as they had not shown any reactors for the two previous years — the actual incidence would have been lower than in 1959–60. 3,133 steers tested for sale showed 95 reactors (3.03 per cent.). These steers had been in contact with the reactor herd liquidated in 1959–60. 297 native-owned cattle being moved from the evacuated infected Wanezi Block showed six reactors (2.02 per cent.).

Testing of 14 Brahman crosses and 97 pedigree Africanders for sale revealed no reactors.

A total testing, therefore, of 43,151 head yielded 416 reactors, i.e. 0.96 per cent.

Of a total of 98,545 tuberculin tests performed on Rhodesia cattle, reactors amounted to 446, a percentage of 0.45.

Meat Inspection Incidence

Cold Storage Commission Abattoirs	Carcase Condemnation		Part Condemnation	
	Bovine	Porcine	Bovine Viscera only	Porcine Head only
Salisbury	1	—	—	—
Bulawayo	5	—	27	42
Umtali	—	—	—	1
Fort Victoria	2	—	29	—
TOTAL	8	—	56	43
TOTAL SLAUGHTERINGS	230,795	93,809		

Notes

Bulawayo Bovine Condemnations:

(a) Carcasses—three were reactors from ranch test.
(b) Viscera—22 were reactors from ranch test.

Porcine Condemnations:
Thirty were in native-owned pigs from Bechuanaland Protectorate.

Fort Victoria Bovine Condemnations:

(a) Carcasses—one was a reactor from ranch test.
(b) Viscera—25 (16 reactors, 9 indeterminate reactors) from ranch test.

Bovine Brucellosis

Infection was confirmed on the following premises:

Veterinary Districts

Salisbury	36	Bulawayo	3
Gwelo	9	Umtali	3
Fort Victoria	6	Chipinga	3
Sinoia	6	Gwanda	1

Total = 67

4,445 samples were tested in respect of 240 premises, with 369 positives.

Quarter-evil (Clostridium chauvoei)

Outbreaks were confirmed as follows:

Veterinary Districts	*Outbreaks*	*Deaths*
Salisbury	21	123
Chipinga	19	59
Bulawayo	18	79
Sinoia	18	92
Umtali	11	143
Gwelo	10	35
Fort Victoria	8	33
Gwanda	3	15
TOTAL	108	579

More vaccination in respect of this disease has been done in the European areas this year but it is tragic to record again the gradual abandonment of annual vaccination of young stock in the native reserves. Four reserves were only vaccinated after deaths had occurred and this is now the recurrent pattern of events in these areas. The deaths recorded are barely an actual tenth of the mortality that must occur before the outbreak is actually brought to light.

PROTOZOAL DISEASES

Trypanosomiasis

See report of the Assistant Director of Veterinary Services (T. and T.C.).

Theileriosis (Gonderia lawrencei)

Confirmed outbreaks were:

Districts	*Centres*	*Deaths*
Fort Victoria	10	39
Sinoia	4	20
Umtali	3	14
Chipinga	1	7
TOTAL	18	80

The control policy evolved in 1957 has now shown its anticipated end results this season and it is fully evident that if peak control (i.e. five-day dipping, clipping of ears and tails, plus hand-dressing) of Rhipicephalids is enforced at their first seasonal rise, in old Theileriosis centres and any premises to which cattle from such centres have been moved, then the breakdown and spread from the recovered carrier is definitely stopped, as the records of the years demonstrate—

Year	*1957*	*1958*	*1959*	*1960*	*1961*
Outbreaks	34	22	33	37	18
Deaths	601	437	274	182	80

FUNGAL DISEASES

Streptothricosis

The high incidence in the Gokwe District has been reduced to negligible proportions as a result of last year's deaths and the slaughtering of all chronic cases.

DISEASES DUE TO MITES

Sheep Scab

An eradication drive in the Sabi Valley, Chipinga District, entailed the examination of 4,476 sheep and 13,997 goats. Two centres were disclosed and continued B.H.C. dipping was enforced.

Scab was also diagnosed and treated in the Maranka Native Reserve, Umtali.

Pigs

Eight outbreaks of scabies were confirmed in the Chipinga, Sinoia and Bulawayo Districts.

Demodex mange was recorded in a slaughtered pig at the Bulawayo Abattoir.

One case of sarcoptic mange was diagnosed in a horse in the Chipinga District.

Wildebees (Gorgon *sp.*)

Sarcoptic mange was confirmed in these antelopes in the Wankie Game Park.

SPECIFIED DISEASES OF POULTRY

Viral Diseases

Epidemic Tremor

This disease was diagnosed in two commercial hatcheries in the Salisbury District. Dissemination to various purchasers of day-old chicks had occurred, both inside and outside the Colony.

It is interesting to note that in some of the day-old chicks, which had been subjected to prolonged travel stress, morbidity mounted to 50 per cent., with a mortality of 30 per cent.

Bacterial Diseases

Fowl Cholera

Five outbreaks were confirmed and 1,258 birds were slaughtered with compensation. In view of the rising incidence in African areas, the slaughter policy was put on a compensation basis to avoid driving the disease underground.

Fowl Typhoid

Seven major outbreaks, 407 deaths and the slaughtering of approximately 1,500 birds were recorded. Four of the owners elected to treat with Furazolidone instead of testing-out their birds.

Bacillary White Diarrhoea

No outbreaks were confirmed. One hundred and twenty flocks were tested, a total of 86,992 birds, and certificates of freedom from disease were issued.

NON-SPECIFIED DISEASES

Ephemeral Fever

The continuous rains and prolonged humidity, favourable to the vectors, produced severe prolonged outbreaks of this disease, especially in the Midlands and Matabeleland. Starting in January, with peak occurrence in March, cases were still being recorded in May and June.

Loading of beeves had to be cancelled, as whole herds were affected and the loss in milk, associated with abortions, in dairy stock in the Midlands was heavy.

Deaths from dehydration, animals being unable to walk to water, were recorded in the lowveld.

Vibrio Foetus

1,207 tampons were submitted from the districts and 118 positives were recorded, involving 11 premises. Majority opinion of owners of infected herds is that this disease is of little import as regards infertility in beef herds.

Paratyphoid

Many owners of ranching cattle regard this disease as an occupational hazard when stock have to be kraaled because of carnivora, lack of paddocking, etc., and accept the death of scouring calves without investigation or reporting. The disease was confirmed on four ranches, with 52 deaths, but little vaccination is effected except in the better dairy herds.

Heartwater

The wide usage of Toxaphene dips and the employment of terramycin as a curative has given major control of this disease in the lowveld and losses are now minimal. The paucity of reports of deaths and disinterestedness in the evolution of a vaccine is in striking contrast to the vociferous demand for the local production of a vaccine in 1954–56. Ranchers are now of the solid opinion that this is a disease easily controllable by specific dipping.

Sweating-sickness

Many cases were reported in the Midlands, but elsewhere incidence was small.

Malignant Catarrh (Snotsiekte)

Two deaths were reported in the Beitbridge area after about 20 per cent. morbidity in cattle mixing with wildebees.

Myiasis

There were very few cases in European areas but it is still recurrent in tribal areas.

Ophthalmia

This has been marked in exotic breeds in the lowveld, especially Herefords and Angus. General incidence has, however, been of a mild type.

Orf (Ecthyma contagiosum)

Mortality in kids was noted in a tribal area with spread into exotic sheep on an adjacent ranch.

Enterotoxaemia

Many deaths have been recorded in the growing sheep population following sudden switches in grazing and also after anthelmintic dosing. The need for vaccination is gradually being more widely appreciated.

Tetanus

The use of the elastrator in docking and castrating lambs has given an alarming death rate, up to 40 in one flock, and this method has been actively discouraged in most districts.

Blue-tongue

There were eight deaths in unvaccinated German Merinos in the Eastern Districts and one death in the Bulawayo District. A strong suspicion of this disease, giving mortality in goats in a Matabeleland Reserve is, under active investigation.

Foot-rot (Sheep)

An outbreak of classical foot-rot (*Fusiformis* plus *Spirochaeta*) was seen in the Matobo District in a black vlei area with a high rate of contagion.

Horse-sickness

An extremely virulent form was noted in the early summer and horses, who had received multiple inoculations over the years, succumbed. Thirty deaths were reported but many other deaths occurred in horses attended by private practitioners.

Febrile Agalactia

A few piggeries had many sows affected with this condition, mostly associated with metritis and/or septicaemia. Elsewhere, only sporadic cases were reported. Treatment with dimycin streptomycin and/or sulphamezathine is not giving the favourable results first recorded.

Bowel Oedema

This has become a decimative problem in all piggeries and up to 400 deaths have been recorded. A virulent haemolytic *Escherichia coli* has been isolated. The majority of affected animals show the acute enteritic form with shock death and blanching of the carcass, marked in weaners and porkers.

The most effective control measure to date would seem to be rigid cleansing and disinfection of styes. Bifuran has been tried, but the expense is considerable. Antibiotic premixes have proved of no value in prevention.

Paratyphoid (in pigs)

Several outbreaks have been confirmed, with excellent control from Bifuran therapy.

Virus Pig Pneumonia

During the year, it became evident that this disease had established itself in a number of piggeries. It would appear that the infection is less virulent than that experienced elsewhere and all owners report that there has been little or no evident loss in the food conversion ratio in the affected herds. No evidence of infection appears until the piglets are weaned and are at the light porker weight. Only one suspicious lesion has been noted in adult sows slaughtered from the infected premises. A high percentage of lung lesions in bacon pigs from one of the affected premises has been noted, e.g. 36 out of a 48 lot and 39 out of a 49 lot slaughtered.

Avian Leucosis Complex

Severe affectation of five-week-old chicks and laying pullets was recorded in the Bulawayo District, with mortality up to 20 per cent.

Visceral Gout (Avian)

Several premises suffered markedly and mortality reached ± 20 per cent.

Haemorrhagic Disease of Poultry

A syndrome suggestive of this disease was investigated in the Bulawayo District; mortality nil, morbidity ± 80 per cent.

Haemorrhages were marked in the intestines, tibio-tarsal joints, air-sacs, peri-orbital tissues and through the feather folloicles.

Recovery ensued, following change of feed and withholding of coccidiostats.

Verminosis

The rapid build-up of worm populations, particularly in young stock, is without doubt the most potent of all the factors involved in the general poor condition of cattle on the veld.

Marked activity in the control of internal parasites has been maintained, despite staff shortages, and propaganda regarding prophylactic dosing is gradually showing its effects. More faeces samples are being submitted for examination and dosing programmes have been adopted in line with the microscopical findings. Once dosing programmes are adopted, the obvious stock gains ensure their continuance. Generally speaking, prophylactic measures are in widespread use, but tend to be sporadic. *Haemonchus* and *Bunostom* spp. seem to be commonest and most dangerous. *Oesophagostomum* sp. takes the heaviest toll in sheep. A noticeable hardening of adverse opinion regarding the poor results from anti-snail spraying, costly in both medicaments and labour, has arisen during the year in the face of continued fluke infestation in cattle.

Extended field trials of Phenothiazine (Microfine), Phenothiazine plus Coroxon, Promintic and Neguvon A in sheep, also Phenothiazine with Hexachlorophene, Neguvon A with Hexachlorophene, Hexachloroethane with prestimulation, and Tolon alone, in cattle are in progress in the Victoria area.

Chipinga District is still continuing field supervision of dosing of sheep on the Government Demonstration Farm, but dosing trials had to be abandoned owing to lack of staff.

Other districts have done limited field trials with Promintic, Dylox and BIS 356 and local recommendations are being made in respect of their usage.

Protozoal Diseases

Piroplasmosis (Redwater)

Confirmed on 148 premises with 121 deaths, which represents a small proportion of the total deaths. With the efficacy of organic phosphate dipping and the marked reduction in blue-tick infestation, this disease is lessening in incidence. Two fatal cases in pigs and one in an eland were diagnosed.

Anaplasmosis (Gallsickness)

Diagnosed on 297 premises with 105 deaths. Mortality in this disease has been decidedly cut by the use of Terramycin.

Coccidiosis

Twenty-five cattle deaths from this infection were confirmed, mostly in young stock. A continued increase of occurrence in sheep has been noted that might be of pathogenic significance if confined grazing becomes a practice. The usual widespread incidence in poultry, with mortality in young chicks, occurred despite cheap and easily available coccidiostats. It was also confirmed in rabbits.

Trichomoniasis

Confirmed in a dairy herd in the Bulawayo District, straight-smear examination revealing Trichomonads in a bull and two cows.

Deficiency Conditions

Aphosphorosis

Widespread recognition of the need for phosphorus supplementation is now evident but, despite such, the condition is still occurring in large-framed cows with calves at foot.

A very interesting combined trial is being effected in the Victoria District in conjunction with a Native Department Experimental Station. Sixty heifers were divided into random lots of 10 for trials on various supplementations of feed on a

communal veld grazing. Checks on ovarian activity and pregnancy were made each month. The following were the supplements supplied:

Group 1. Control — Veld grazing.

Group 2. Bone-meal — 15th May to 15th November.

Group 3. Bone-meal — Vitamin A 200,000 I.U. per month, 15th May to 15th November.

Group 4. Vitamin A 200,000 I.U. per month — 15th May to 15th November.

Group 5. Protein 2 lb. per head per day groundnut cake — 15th May to 15th November.

Group 6. Protein and bone-meal daily.

The following is a summary of the results so far—

1. *Liveweight Increment.* Considered as group mean of dam and progeny weight gains from initial weight.

	Group 1	*Group* 2	*Group* 3	*Group* 4	*Group* 5	*Group* 6
Mean increase in weight in year in lb. . . .	186	230	184	188	210	274

2. *Weaning Weights.*

Mean birth weight	41·6	41·2	45·5	39·3	48·6	49·7
Mean weaning weight at 200 days . . .	240	271	232	248	304	320

3. *Pregnancy.* Bulls were in the herd from January to March. The following are the group of cows pregnant in each group of 10.

Group 1	5
Group 2	5
Group 3	5
Group 4	6
Group 5	8
Group 6	8

It is interesting to note that in the protein groups there was a more consistent resumption of oestrus activity post calving, and also a higher pregnancy rate, and continuously suckling cows not in receipt of protein in the previous winter displayed a greater tendency to remain inactive throughout the breeding season.

The two protein groups showed more ovarian activity than the other groups during the mating season.

Iodine Deficiency

In the Sinoia region, where deaths of lambs were seen from this condition, the feeding of a combined trace mineral mixture containing iodine was useless, but feeding with iodised salt speedily terminated the mortalities.

Vitamin A

Where feeding supplementation has been practised, this has not been a success in several districts. This may be due to excess of nitrites in weed-infested grazings, which directly interfere with proper utilization of vitamin A precursors.

POISONING

Arsenic. The deaths of 654 cattle, 22 goats, 5 donkeys and 50 poultry occurred from sheer carelessness in the handling of concentrated dip or in the control of dipping tanks. Many cattle were also severely scalded by reckless additions of concentrated fluid without ordinary dip test control.

It is disheartening to staff to see this needless mortality go on year after year.

Lead. Nineteen cattle died as a result of consuming old car batteries, etc.

Nitrites. Two cattle were poisoned by ingestion of fertilizer.

Copper Sulphate. Seven cattle were killed by using excessively strong solutions in prestimulation when administering anthelmintics.

Hydrocyanic Acid. Deaths in goats and cattle were recorded due to wilting of cyanogenetic grazings.

Salt. Four pigs died from excessive consumption.

ORGANICS POISONING

Fertilizers. Fourteen cattle and three pigs succumbed after consuming from leaking bags, etc.

Dips. Toxaphene. Twenty-two calves died from over-strength solutions in tanks. Phosphates. Fourteen cattle died after hand-dressing in over-strength solutions. D.D.T. Eight ducks died after being sprayed.

Anthelmintics. Hexachloroethane. Eighty-nine weaner steers and 52 sheep died after dosing. Negworm A. 154 sheep died after dosing.

FOOD POISONING

Urea. Sixty-four cattle and ten sheep were killed by over-consumption after blocks had melted in rain.

Moulds (native brewers' grains). Three oxen, four calves and 27 pigs died.

Diplodia (on maize). Reported deaths amounted to approximately two hundred cattle — a well-known condition and deaths are seldom reported. Prolonged rains gave heavy contaminations.

PLANT POISONING

Three hundred and five known deaths were recorded, of which 141 could not be diagnosed specifically. Senecio still takes its toll in the Eastern Districts and is also of growing hazard in the North Midlands. *Urginea burkei* fatalities are mounting in the North Midlands.

Crotalaria, although not causing mortalities, has been troublesome in Matabeleland, where many small plants covered the veld after the drought and cattle could not help consuming them with grass. Many chronic laminitis cases ensued.

Dichapetalum cymosum (M'kauzaane) caused heavy mortalities in the Lupane, Nyamandhlovu and Gokwe Districts and deaths are calculated in the region of ± 600, seldom being reported in the tribal areas.

Other plants incriminated in stock losses include castor-bean, jack-bean, *Lantana* spp., *Chinepodium album* and *Cassia floriabundus.*

ARTIFICIAL INSEMINATION

Two centres were operated at Bulawayo and Gwelo by the Field Branch, Salisbury Centre being operated from the Research Laboratory by that Branch.

Returns	*Inseminations* 1960–61	*Doses Sold* 1960–61	*Inseminations* 1959–60
Gwelo	807	138	886
Bulawayo	2,301	209	2,557

The drop in figures at both centres is mainly due to owners buying deep-frozen semen and inseminating their own stock.

Conception rates averaged at 68.1 per cent. in Bulawayo and 72.5 per cent. in Gwelo.

With the total supply of deep-frozen semen from the Republic of South Africa, a widened breed service was available.

At Bulawayo, the following numbers of semen doses were used:

Frieslands	1,898
Jerseys	386
Guernseys	13
Charollaise	4
TOTAL .	2,301

Semen sold (Bulawayo), 200 Friesland, 9 Jersey.

In Bulawayo we have failed to get the support of the near-at-hand, peri-urban, small plotholder and mileage is high, at an average of 16.8 miles per insemination in a 30-mile radius, compared to Gwelo's average of 9.3 miles per insemination.

Since 1st December 1960, semen at Bulawayo has been issued entirely from the Transvaal Artificial Insemination Centre, Irene, South Africa, and bulls of a very high quality have been available.

Gwelo changed over to deep-frozen semen in February 1961.

BEEF EXPORT DRIVE

As many farmers' meetings as possible were attended, despite the shortage of staff and heavy pressure of emergency duties, and propaganda for improved animal husbandry was maintained at a high level.

Meetings attended by professional staff:

Field Days	*Discussion Groups*	*I.C.A. Groups*
51	95	39

In addition, many farmers' meetings were attended by lay staff:

Lecture notes were supplied for circulation with I.C.A. News Letters.

The public has made much more use of the services at local District Offices, as demonstrated by the following returns:

Smears examined	*Post-mortems performed*	*Biological samples examined*
10,167	855	1,539

My thanks are expressed to the staff of both Federal and Territorial departments with whom the Department of Veterinary Services has worked closely during the year.

In conclusion, I wish to express my intense appreciation to all members of my own staff whose devotion to duty has been the main factor that has brought us successfully through a most trying year as regards disease control.

STOCK SLAUGHTER FIGURES

	Cattle	*Pigs*	*Sheep and Goats*
Salisbury C.S.C.	93,036	51,969	8,201
Bulawayo C.S.C.	90,236	15,491	7,148
Fort Victoria C.S.C.	46,443	7,494	1,272
Umtali C.S.C.	10,080	18,855	2,713
TOTAL	239,795	93,809	19,334
1959–60 TOTAL	253,962	95,228	18,848

CONDEMNATIONS

	Cattle	*Pigs*	*Sheep and Goats*
Salisbury C.S.C.	1,307	111	27
Bulawayo C.S.C.	414	397	4
Fort Victoria C.S.C.	538	36	9
Umtali C.S.C.	91	39	3
TOTAL	2,350	583	43

MAIN REASONS FOR CONDEMNATIONS

	Cattle	*Pigs*	*Sheep and Goats*
Emaciation and Oedema	500	14	26
Measles	467	385	—
Sarcocysts	222	23	—
Bruising	83	2	—
Pyaemia	27	69	—
Pleurisy and Peritonitis	141	3	2
Tuberculosis	7	—	—

Measle incidence (detained for freezing), 2,241 carcasses.

CATTLE CENSUS AND DIPPING TANKS

	European	Native	Total	Dip Tanks	Spray Races
Salisbury	372,241	343,032	715,273	1,490	412
Bulawayo	363,157	424,307	787,464	1,085	80
Umtali	67,712	175,545	243,257	431	84
Gwelo	345,097	317,146	662,243	924	51
Fort Victoria	211,780	437,854	646,634	643	89
Gwanda	124,755	240,007	364,762	330	9
Chipinga	55,191	54,064	109,255	234	14
Sinoia	124,735	64,926	189,661	385	138
TOTAL	1,664,668	2,056,881	3,718,549	5,522	877

IMPORTATIONS

	South Africa	*Northern Rhodesia*	*South-West Africa*	*United Kingdom*
Bulls	164	—	1	—
Cows	28	—	5	—
Heifers	26	—	91	—
Calves	6	—	5	—
Oxen	—	147	—	—
Mares	130	1	—	—
Stallions	28	—	—	—
Geldings	380	—	—	1
Mules	155	—	—	—
Pigs	3	—	—	—
Sheep	1,022	—	—	—

Bovine 473, Equine 695, Porcine 3, Ovine 1,022.

Slaughter Stock:	*South Africa*	*Bechuanaland Protectorate*
Sheep	5,717	—
Pigs	—	741

EXPORTATIONS

	South Africa	*Bechuanaland Protectorate*	*Northern Rhodesia*	*Nyasa-land*	*Moçam-bique*	*Congo*
Bulls	—	—	114	6	19	—
Cows	—	—	424	2	211	—
Heifers	2	—	86	5	222	—
Calves	—	—	—	1	24	—
Mixed Cattle	—	—	581	—	—	—
Oxen	—	—	85	—	80	—
Mares	13	—	17	—	2	—
Stallions	11	—	1	—	—	—
Geldings	21	2	70	—	5	11
Donkeys	—	—	12	—	3	—
Pigs	—	—	38	1	1	—
Sheep	—	—	84	—	—	—
Goats	—	—	10	—	—	—

Bovine 1,862, Equine 168, Porcine 40, Ovine 84, Caprine 10.

Slaughter Stock:	*Northern Rhodesia*
Mixed Cattle	875
Sheep	112
Goats	8
Oxen	1,014
Cows	350

REPORT OF THE ASSISTANT DIRECTOR OF VETERINARY SERVICES (RESEARCH)

For the year ending 30th September 1961

D. K. SHONE, *Acting Assistant Director of Veterinary Services (Research)*

STAFF

Mr. R. M. Roberts returned from a Food and Agricultural Organization Fellowship in October 1960. He spent four months at the Royal University, Copenhagen, Denmark, and also visited Sweden and the United Kingdom. The information and experience he has gained of recent developments in the field of infertility has proved most valuable.

Mr. J. B. Condy completed a six month Food and Agricultural Organization Fellowship in Australia. He left the Federation in January 1961, and returned in July, 1961. Most of the time was spent at the McMaster Institute, Sydney, where he studied in particular the identification of helminth larvae and undertook some work with radioactive labelled blood in studying blood losses in helminth infestations.

The information and experience he has gained will assist materially in the control of helminthiasis in this country. The problem of helminthiasis is particularly acute in this country owing to the system of sheep management which has to be practised by most farmers.

These Fellowships and visits made to other institutions and congresses are proving invaluable. Not only does it enable the worker to become acquainted with the most up-to-date techniques and knowledge, but the contact with other workers in the same field provides a most vital mental stimulus. This is of particular importance in a country such as this where, more often than not, the individual is the solitary worker in his particular field.

Mr. J. R. Philip has been granted an additional three years leave of absence to pursue studies on avian pathology at the School of Veterinary Medicine, Davis, California. He will complete his studies in 1964.

The increase in the professional establishment by a pathologist, poultry specialist and pig specialist is very welcome. The need for a pathologist has, in the past year, been stressed by the outbreaks of epidemic tremor in chickens and "X" disease in ducklings. The pathologist at the Laboratory will work in very close association with the meat inspector specialist appointed to the Field Staff, whose work is also primarily of a pathological nature.

The rapidly expanding poultry industry will benefit greatly by the creation of a poultry specialist post, as will the pig industry from the pig specialist post.

The establishment of a training course for medical laboratory technologists is a very much needed innovation and all technical staff are being very strongly encouraged to take advantage of this facility. Unfortunately, under the present regulations, only laboratories under a registered medical practitioner are recognized for the training of individuals for the Medical Council examination. It is hoped that the regulation will be amended to include veterinary laboratories. In the United Kingdom both veterinary and medical laboratories are recognized.

ROUTINE SERVICES

The routine services undertaken are detailed below. These figures are not a true reflection of all the examinations undertaken, for many of the specimens are made up of several components which, for record purposes, are taken as one specimen. Every year sees an increase in the diversity of the examinations being undertaken. The appointment of a pathologist will extend the scope of this work to a very great extent.

Diagnostic Services

Blood smears	85
Bacteriological examinations	768
Agglutination tests on sera	5,463
Agglutination tests on tampon extracts	1,791
Examination of milk for mastitis	1,073
Brain specimens for rabies	81

Bovine foeti	61
Faecal specimens	234
Poultry post mortems	1,349
Sheep and goat post mortems	37
Pig post mortems	51
Bovine post mortems	4
Rabbit post mortems	42
Chinchilla post mortems	6
Other specimens	129

Post Mortem Examinations

1,489 post mortems, as detailed below, were undertaken. This is a decrease of 762 on the previous year's figures and is due to a decrease in the number of animals which have died in the course of experimental work, the reference of all routine post mortems to the District Veterinary Office, the discontinuation of the submission of poultry for post mortem examination by a large poultry breeder, as also the termination of an arrangement with an egg producer to submit all dead fowls in a study of the incidence of cancer in such a flock.

	1960	*1961*
Poultry	1,980	1,349
Sheep	128	36
Pig	85	52
Bovine	37	4
Rabbit	18	42
Chinchilla	3	6

Other Examinations

Brucella abortus: Sera tested, 4,967; number positive, 397. Vaginal tampons tested, 1,791; number positive, 142.

Vibrio foetus: Vaginal tampons tested, 1,791; number positive, 301.

Rabies: Specimens examined histologically, 80.
Specimens examined biologically, 76.
Specimens positive on histological examination, 7.
Histological negative specimens positive on biological examination, 2.

Tuberculosis: Specimens examined, 14; number positive, 1.

Quarter Evil: Specimens examined, 6; number positive, 1.

Enterotoxaemia: Specimens examined, 15; number positive, 6.

Mastitis: Samples examined, 1,073; number positive, 390.

Salmonellosis in cattle, 198. (Bovine and pig gall-bladders collected at the Salisbury abattoirs were examined for the presence of salmonellas. No salmonellas were isolated.)

Poisoning: Specimens received, 500; positive for arsenic, 223; positive for nitrates, 1; positive for lead, 5.

POULTRY DISEASES

During the year 1,349 post mortem examinations were undertaken on poultry. This represents a decrease of 631 on the previous year's figures.

Diagnosis

Fowl typhoid	11
Fowl cholera	12
Avian encephalomyelitis	73
Coccidiosis	213
Fowl-pox	9
Avian respiratory mycoplasmosis (C.R.D.)	24
Lymphoid leucosis	151
Neurolymphomatosis	8
Other tumours	18
Histomoniasis	59
Nephritis	6
Injury	17
Poisoning	15
Faulty management	84
Oophoritis and peritonitis	87
Salmonella typhimurium	21

Avian respiratory mycoplasmosis (Chronic Respiratory Disease)

There has been a gradual increase of interest amongst breeders wishing to eradicate the disease from their flocks. The control of this disease is of special importance to farmers engaged in rearing broilers. It can also be of importance in other flocks where housing and management are poor.

Eight hundred and ninety-six birds were tested for agglutination bodies with a p.p.l.o. antigen.

Coccidiosis: Caecal coccidiosis *(Eimeria tenella)* remains the biggest killer of young chickens. Generally it is the small farmer, whose experience of poultry management is poor, who is worst affected. On the larger broiler plants the disease is effectively controlled by the use of premedicated feeds. There is as yet no evidence in this country of a resistance developing to any of these drugs.

An outbreak of intestinal coccidiosis, due to *Eimeria acervulina,* had disastrous effects on weight gains in a broiler flock. Weight losses were substantial and no birds could be marketed for several weeks. The management and hygiene on this plant were of a low standard. The outbreak was controlled by the use of sulphadimidine.

An acute outbreak of coccidiosis amongst turkey poults was also encountered. Mortality was high and the post mortem examinations showed severe haemorrhagic enteritis extending from the duodenum to the caeca. The species of Eimeria involved was not determined.

PREVENTIVE AND CURATIVE SERVICES

In the past year the sale of quarter-evil vaccine has decreased by 189,060 doses. This is a matter of some concern, in view of the country-wide incidence of the disease. It is known that some of the commercial vaccines are sold with the recommendation that for all practical purposes a single dose in an animal's lifetime is sufficient. This statement is based upon the fact that in most cases an animal will contract natural quarter-evil while still immune from the vaccine, thus conferring a solid immunity lasting the two years until a natural resistance to the disease develops. There is no experimental evidence to suggest that the immunity extends very much beyond one year and the annual vaccination of all animals from the ages of five months up to three years is recommended.

It was not thought, however, that this policy of single vaccination could have had such an influence on vaccine sales. Examination of the records of the sale of quarter-evil vaccine has shown a drop from 234,920 doses in 1960 to 78,100 doses in 1961, a difference of 156,820 doses in the amount of vaccine purchased for use in African areas. The policy of only vaccinating cattle once an outbreak is diagnosed is much to be deplored, as it is contrary to all the principles of preventative veterinary medicine. The African's habit of cutting up and eating dead animals usually results in the disease becoming widely distributed and heavy losses occurring before control is achieved.

This intermittent use of the vaccine makes the task of producing vaccine very difficult in so far as one has to predict the anticipated demand, for it takes at least a month to produce a batch of vaccine and to safeguard against the failure of a batch as well as to build up stocks for times of heavy demand, the requirements must be predicted some three months ahead. The previous year's sales are used to anticipate the next year's requirements and, in circumstances such as these, one finds a surplus of say 150,000 doses on hand which has to be discarded, as the shelf life of these vaccines is limited to six months.

Occasionally, quarter-evil is diagnosed in an animal which has been vaccinated: In all these cases, steps are taken to confirm the diagnosis by laboratory tests and if any of the original vaccine used is available, its potency is re-examined in sheep. To date all such vaccines have been found to be fully potent and these deaths can only be ascribed to faulty administration of the vaccine or idiosyncracies of individual animals.

Following trials, the immunizing component of the quarter-evil vaccine has been doubled in quantity. It is hoped that this will result in a higher level of immunity towards the end of the twelfth-month post-vaccination period. The dose remains unchanged at 2½ cc.

Vaccines

	1961	1960	1959
Anthrax vaccine	174,078	282,380	169,210
Blue-tongue vaccine	20,000	7,400	6,100
Calf paratyphoid vaccine	7,281	4,820	5,984
Calf paratyphoid vaccine for use in adults	473	290	355
Contagious abortion vaccine (S. 19)	86,427	89,494	72,605
Enterotoxaemia vaccine	5,650	—	2,100
Fowl-pox vaccine	485,180	410,800	377,500
Gall-sickness vaccine	18,885	15,520	16,818
Horse-sickness vaccine	5,370	4,771	4,654
Lumpy-skin disease vaccine	175	—	—
Quarter-evil vaccine	475,330	664,390	643,400
Quarter-evil/Malignant Oedema	55,380	55,150	38,470
Redwater/Gall-sickness vaccine	8,133	9,666	7,295
Rift Valley Fever vaccine	550	50	650

Remedies

Nodular worm remedy (tins), 350.

Quarantine of Imported Animals

Breed	*U.K.*	*Holland*	*Republic of South Africa*	*Southern Rhodesia*	*Nyasaland*
Cattle—					
Friesland	—	1 bull 1 cow 2 heifers	3 bulls	—	—
Shorthorn	—	—	1 bull	5 bulls	—
Hereford	—	—	2 bulls	3 bulls	—
Jersey	1 bull	—	1 bull	—	—
Ayrshire	1 bull	—	—	1 bull	—
A. Angus	3 bulls	—	—	—	—
Hissar	—	—	—	—	5 bulls
Pigs—					
Wessex	1 boar	—	—	—	—

Redwater and Gallsickness Vaccination

Thirty cattle were immunized.

Bacillary White Diarrhoea Antigen

Sufficient B.W.D. antigen was prepared and issued to test 156,000 birds.

ARTIFICIAL INSEMINATION

The committee set up by the Ministry of Agriculture to review the artificial insemination service recommended to the Minister of Agriculture that the service should be operated entirely on deep-frozen semen imported from the Republic of South Africa. The Minister accepted this recommendation and the remaining bulls were disposed of and deep-frozen semen was imported from South Africa. The Service has operated entirely on imported deep-frozen semen since January 1961.

Deep-frozen semen was used in this country six years before the change over to imported semen took place and we had full confidence in the use of deep-frozen semen before importation commenced. Practically no deep-frozen semen is used in South Africa due to lack of facilities for storing it.

It will be noted that there has been a decrease in the number of inseminations performed. This is due to the disposal of several herds in the Salisbury area which were using A.I., and to some farmers within the areas served by inseminations choosing to buy semen and inseminate their own cows. The largest herds in Gwelo and Bulawayo were lost because of the farmers deciding to do their own inseminations. This practice is regrettable as it often results in poor conception rates and to the farmer abandoning A.I. completely.

Artificial insemination is unlikely to expand in this country to reach the proportion it has achieved in other countries, due primarily to the cost of the service. The high cost of the service is due to the dispersed nature of the farms and to the distances which have to be travelled.

The lack of interest in a gift of semen from proven British bulls was very disappointing. It is of importance to maintain the service as a disease control measure and also to maintain it to the time when methods of proving bulls will have improved to the stage when every progressive farmer will want to breed from proven bulls. At the present stage of development of the dairy industry, and at the present rate at which the service is being used, the possibility of being able to prove bulls in this country, using the present day techniques, is very remote.

Totals of all Centres per quarter	Conception Rates			Repeats			
	C'R%	1st	N.R.	1st	R.	Totals	R.%
July to September 1960	72	808	582	808	507	1,315	38·6
October to December 1960	74·7	637	476	637	422	1,059	38·9
January to March 1961	68·9	665	458	665	393	1,058	37·1
April to June 1961	65·6	760	499	760	421	1,181	35·6
Annual Totals of Centres:							
Salisbury	71·6	1,101	789	1,101	517	1,618	31·9
Bulawayo	67	1,282	872	1,282	938	2,220	42·2
Gwelo	73·1	487	356	487	271	758	35·7
Annual Totals (all Centres)	70	2,870	2,017	2,870	1,726	4,596	37·8
C'R%			70				

OCTOBER 1960 TO SEPTEMBER 1961

Doses of semen used	1961	1960	1959
Salisbury Inseminator	2,226	2,389	1,869
Bulawayo Inseminator	2,301	2,557	1,717
Gwelo Inseminator	807	886	635
Salisbury—sold to farmers	1,573	2,129	1,773
Bulawayo—sold to farmers	209	21	17
Gwelo—sold to farmers	140	—	1
Salisbury Veterinary Dept. Animals	71	54	74
TOTAL	7,327	8,036	6,086

Details of semen used	1961	1960	1959
Doses Friesland Semen	6,152	7,137	5,386
Doses Jersey Semen	1,074	883	718
Doses Guernsey Semen	19	—	—
Doses Charollais Semen	21	—	—
Doses Ayrshire Semen	61*	—	—
Doses Red Poll Semen	—	16*	—
	7,327	8,036	6,104

* Private importations.

Mileage covered by inseminators	1961	1960	1959
Salisbury	45,595	44,375	31,921
Bulawayo	37,115	39,247	28,708
Gwelo	8,045	8,436	6,319
TOTAL	90,755	92,058	66,948

Revenue	1961 £ s. d.	1960 £ s. d.	1959 £ s. d.
Salisbury	3,811 12 2	4,732 1 9	3,849 1 8
Bulawayo	3,189 12 6	3,212 0 0	2,302 15 0
Gwelo	1,160 0 6	1,085 16 0	792 19 0
TOTAL	£8,161 5 2	£9,029 17 9	£6,944 15 8

INVESTIGATIONS AND RESEARCH

Avian encephalomyelitis (epidemic tremor) was diagnosed in Southern Rhodesia for the first time in March 1961. Confirmation was made by biological tests in day-old chickens and by histological examination. The inoculated birds developed typical symptoms after an incubation period of 32 days. The Director of Veterinary Services of the Republic of South Africa kindly undertook the histological examinations.

Infection was detected on two poultry farms situated some forty miles apart and with no apparent contact. In both cases cross-bred chickens were involved and infected eggs were produced for a period of nearly three weeks when hatching was stopped.

The morbidity rate was in the region of 50 per cent., and the mortality rate varied from 5 to 20 per cent. Affected chickens never fully recovered from the effects of the infection. Apart from poor weight gains, nervous symptoms persisted for up to four months while under observation.

This disease can be very serious for both the producer of day-old chickens who, after selling several batches of infected chicks, is likely to have lost all his clients, and also for the broiler producer, who may have accepted several batches of infected chicks and experienced heavy mortality in addition to losses from poor weight gains and delayed marketing.

Groundnut toxicity

Turkey "X" disease, which it is estimated was responsible for the loss of 100,000 turkey poults in Great Britain in 1960, has been shown by workers in

that country to be due to a toxic factor in some consignments of groundnut meal from certain tropical countries.

In April 1961, heavy mortality occurred in a batch of ducklings on a farm in the Marandellas area. Features observed at the post mortem examination were very severe liver lesions and the submucosal haemorrhages of the gizzard present in all the ducklings. Bacteriological and virological examinations were negative.

The similarity of the lesions observed in the ducklings to those described in the cases of groundnut meal poisoning were noted and specimens, preserved in 10 per cent. formol-saline, were submitted for examination to the Director, Central Veterinary Laboratory, England, who reported that the lesions in the liver were identical with those observed in outbreaks of poisoning with groundnut meal in that country, but that they had not encountered the submucosal haemorrhages of the gizzard.

The groundnut meal incorporated in the ration used here was traced as being part of a single consignment imported from Elizabethville, Katanga.

Specific Infectious Epididymitis of Sheep

During the year the presence of infectious epididymitis of sheep was established in Southern Rhodesia. The disease is recognized as being of the greatest economic importance in Australia, New Zealand and the Republic of South Africa. The effect of the condition is to render completely sterile a proportion of the rams in affected flocks. The presence of the disease in a flock will not be suspected until the number of fertile rams has been reduced to a level which will be reflected in the lamb crop. Very often, in the small flocks of sheep in this country, there are sufficient rams kept to disguise the presence of the disease.

A disease which can cause the loss of valuable males is obviously important and we are now in a position to examine flocks for this disease. The diagnostic procedure involves the collection of semen by electrical stimulation and the examination of stained smears for the presence of the organism.

Agricultural Research Council — Fertility Survey

The Agricultural Research Council fertility survey planned by F. W. B. Leech, M.R.C.V.S., B.Agr., of Rothamsted Experimental Station, England, during a visit to this country in 1960, was due to commence on April 1st 1961, in European-owned herds in Northern and Southern Rhodesia and in African-owned herds in all three territories.

The situation to date is as follows:

1. *African-owned herds*

(a) *Nyasaland.* An attempt was made to commence the survey on 1st April 1961, but the survey had to be abandoned in many areas due to lack of co-operation, and indications are that the results will be such that little significance can be attached to them.

(b) *Northern Rhodesia.* The survey was started on April 1st 1961, but it was found impractical to construct the "sample" of herds as Mr. Leech had wished. It is, therefore, not possible to say what significance will be attached to the results.

(c) *Southern Rhodesia.* It has so far been found impractical to commence the survey on account of staff and political considerations. The sample has not yet been drawn but there has been correspondence with Mr. Leech concerning the way in which this should be done.

It will be seen that, to date, the survey of African herds has made little progress and the prospects of an improvement in the situation are not good.

2. *European-owned herds*

(a) *Southern Rhodesia.* On acount of the professional staff situation and the continued presence of foot-and-mouth disease, it was found impossible to commence the survey on the 1st April 1961.

The survey was first postponed until 1st July 1961, and when it became obvious that the whole survey could not possibly be undertaken on that date, it was decided to conduct a pilot survey of 12 herds in six of the eight veterinary districts.

In the meantime, analysis of the herds in the survey sample shows that owing to lack of handling facilities and poor standards of management, it is unlikely that it will be possible to undertake the survey in a large proportion of cases and, in fact, the survey may fail on these grounds.

Even at this stage the survey has shown that the average standard of management of ranch cattle is very low, which is bound to be reflected in calf crops obtained.

(b) *Northern Rhodesia.* The survey was commenced in 27 of the 30 herds in the statistical sample on 1st July 1961.

Reports to date indicate that the survey is proceeding smoothly.

Trichomoniasis

Experimental work has been proceeding steadily. The discovery of this condition in the Matopos Research Station dairy herd emphasizes that the condition can often be insidious and unsuspected. Use is made of a serological reaction in the diagnosis of this condition in Great Britain and it was hoped to develop a routine serological test, using the tampons which are submitted for vibriosis and brucellosis diagnosis. Investigations are showing, however, that it is possible that the strains of *Tr. foetus,* which occur in this country, differ antigenically from the British strains.

It is very unlikely that there is a high incidence of this condition in the dairy cattle, but little is known of the incidence of breeding diseases amongst ranch cattle and if tampons from non-breeding ranch cows could be tested for all three of the main breeding diseases it would be a great advantage.

Poisonous Plants

Investigations into the poisonous plants of Southern Rhodesia have continued during the past year. In addition to the screening of plants for toxicity to various animal species, chemical pathological studies have been undertaken on cases of induced acute poisoning.

Canavalia ensiformis (jack-bean). Studies on this plant have definitely established its toxicity for cattle and sheep. This information was released in a preliminary publication in the *Rhodesian Agricultural Journal.* Further work has shown that cattle do not develop a tolerance to the poison and that 2 kilograms (4.4 lb.) will induce symptoms in adult cattle. It has also been found that in addition to the enteritis, a severe nephritis is produced. This offers an explanation of the stiff gait and rigidity of the back observed in affected animals. Animals suffering from poisoning will neither eat nor drink.

Jack-bean appears to have a depressive effect upon milk production even in the absence of any clinical symptoms.

Farmers are advised to exercise caution when using the plant as a stock feed and to exclude it entirely from the diet of milking cows.

Other plants examined during the year and found to be poisonous are listed below. No previous record of the toxicity of four of these plants has been found in the literature.

Moreae erici-rosenii
Bersama swynnertonii
Kalanchoe prolifera
Trachyandra saltii
Nicotiana glauca
Gnidia kraussiana
Amanita near to *A. vittadinii*—a mushroom

Manihot esculenta, "Cassava" or "Manioc" as it is commonly known, is widely cultivated by Africans in this country. It is not generally realized that this plant contains dangerous amounts of prussic acid. Deaths of cattle and goats have resulted from eating this plant, which is grown around African huts.

Phyto-chemical Survey. The opportunity was taken during the year of obtaining a large amount of plant material left over after examination for alkaloids by a pharmaceutical firm. This plant material is shade dried and individually identified. All the plants are screened for the presence of prussic acid, selenium, oxalates and nitrates. Sodium picrate is used to screen for prussic acid and spot tests for the remainder. Those plants giving positive reactions to these qualitative tests are later examined quantitatively.

A total of 448 plants has been examined to date.

Fascioliasis (Liver fluke infestation)

A quantity of *Fasciola gigantica* antigen was produced for an intradermal sensitivity test. Cattle destined for slaughter were tested and the results compared with findings at the abattoir.

Total number of animals tested . .	191
number of animals positive	153
number of false negatives	38
number of false positives	37

0.2 ml. antigen was administered intradermally by means of a McLintock syringe.

Reactions commenced immediately and readings could be taken within 30 minutes.

It was found that animals cured of fascioliasis with hexachlorethane reacted positively to the test.

Schistosomiasis and possibly a heavy paramphistome infestation were thought to be responsible for some of the positive reactors.

Stilesia hepatica

Attempts to set up infections by feeding monthly collections of oribatid mites from a known infected property have so far failed. Hexachlorophene, phenolphthalein and gentian violet were found to have no affect on the parasite.

PUBLICATIONS BY MEMBERS OF THE STAFF

Vet. Research Lab. New Policy for A.I. in Southern Rhodesia. *Rhodesian Farmer*, vol. 31, No. 40.

Vet. Research Lab. Gift of 1,000 doses of deep-frozen semen from outstanding British proven sires. *Rhodesian Farmer*, vol. 31, No. 39.

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ACKNOWLEDGEMENTS

I wish to acknowledge the willing and loyal support of the staff throughout the year as well as my appreciation of the co-operation and assistance given to us by other departments and members of the public.

D. K. SHONE,
Acting Assistant Director of Veterinary Services (Research).

REPORT OF THE ASSISTANT DIRECTOR OF VETERINARY SERVICES (TSETSE AND TRYPANOSOMIASIS CONTROL)

for the Year Ending 30th September 1961

J. FORD, *Assistant Director of Veterinary Services*
(Tsetse and Trypanosomiasis Control)

STAFF

Organization

The Branch is a new one and has been formed by the incorporation in the Department of the former Department of Tsetse and Trypanosomiasis Control and Reclamation and its union, as one branch, with part of the former Trypanosomiasis Control Section of the Field Branch. The work of administration of trypanocidal and prophylactic drugs is still undertaken by the Field Branch, acting on the advice received from the Tsetse and Trypanosomiasis Control Branch. The amalgamation has gone very smoothly and has been welcomed both by members of the now defunct Department of Tsetse and Trypanosomiasis Control and Reclamation and by the veterinary officers of the Field Branch.

Mapping Section

A feature of the Branch which has assumed great importance recently has been the production of maps of the operational areas. The use of insecticides and bush clearing involves detailed large-scale mapping of vegetation. Because of their remoteness, most tsetse areas have a low priority in the work of the Government Survey and Cartographical departments. Air photographic cover is available now for all the fly-belts and is used for the planning of all operations. The reproduction of maps produced by the field staff and the preparation of basic topographical maps for use in the field is now a full-time task for a small section comprising the officer-in-charge and two Branch III assistants, plus, at present, a temporary technical assistant. Great progress has been made and our maps are used by many departments other than our own.

Accommodation

All officers, save one, who are stationed in the field are accommodated in Government quarters, varying from a standard Government house in Gokwe, through various types of sub-standard and prefabricated houses, to metal hut encampments.

PROGRESS OF TSETSE AND TRYPANOSOMIASIS CONTROL

General

The map attached to this report shows the present outline of the tsetse belts, the areas in which cattle are subject to treatment, either prophylactic or curative, and the major operational zones.

The reports of the Chief Veterinary Trypanosomiasis Officer, on the disease and treatment situation in cattle pastured around the periphery of the fly-belts, follow, together with the reports on the progress of tsetse control in various areas. The Tstetse Field Research Station at Rekomitjie and the Trypanosomiasis Field Research Station at Lusulu are now both firmly established and are beginning to bring in valuable information.

The Trypanosomiasis Situation

From the point of view of incidence of infection, the situation worsened throughout the year with several new centres of infection. The total number of smears and positive cases is lower than in 1960 but this is mainly due to interruption of routine by civil disobedience. The control of the disease was maintained satisfactorily and in the areas which co-operated with the department, deaths due to the disease and even loss of condition were at a low minimum.

Confirmed drug fastness occurred in two centres. In each case the failing compound was Antrycide Pro Salt. Berenil, at 5 m.p.k., proved an efficient sanative in the one area. At the other, the situation, complicated by civil disobedience, is not yet clear.

The Tsetse Situation

On all fronts the system for recording changes in tsetse distribution and density has been greatly improved. Previously, much of the data was obtained from the casual reports of untrained hunters. With the final abolition of the game-destruction method of control, these men have, of course, been discharged but have been replaced by standardized teams in charge of trained Field Assistants operating bicycle patrols and fly-rounds with or without bait animals. One consequence of this much-improved system has been to reveal the presence of occasional tsetse-flies outside their former supposed limits, with a resulting increase, on paper, of the size of the fly-belts. A recent estimate shows 10,976 square miles infested in the Zambezi basin, west of Kariba, 5,536 square miles east of Kariba, 864 square miles in Mtoko and Inyanga North and 1,600 square miles infested in the Sabi River basin, a total of 18,976 square miles.

There has been a new advance of *Glossina morsitans* south of the Ruenya River in Inyanga North, an expansion of the fly-belt from Moçambique. This is an area in which, previously, there has never been any need to carry out anti-tsetse operations. This advance outflanks our control area in Mtoko.

In the Sabi, the progress in creating a defence line has been most encouraging and there has been no deterioration but considerable consolidation in the form of bush clearing and the organization of patrols.

In the 1960 Report, a brief description was given of a discriminative spraying with dieldrin of 100 square miles of fly bush on the Maseme River basin. The area was unprotected from reinvasion, but there now seems little doubt that in its centre 100 per cent. eradication was achieved. In the current year, a much larger operation, also on an experimental basis, was carried out further south, in the Binga District. Spraying was only completed in the last month of the report year and only the beginning of the decline of tsetse population density can now be noted.

In the Gokwe District, an entomologist's house was built and occupied. It is hoped that this area will be one of the first in which an integrated approach, combining anti-trypanosomiasis operations with a land-use programme, will emerge.

In Urungwe, the tsetse-fly front showed little change. An encouraging feature has been the introduction of cattle into the eastern portion of the reserve, while test herds on the western boundaries have remained negative for nine months.

On the Chipinga Border Clearing a start has been made, in collaboration with the Native Administration, on work designed to permit the introduction of stock to the Tamandayi Native Purchase Area.

Game Destruction

It is likely that this will be the last report in which a special section is devoted to this subject. With the cessation of hunting in Mtoko in June, game destruction ceased. Up to that time 752 larger animals and 3,027 smaller (below impala in size) were shot, a total of 3,779, as compared with 17,944 in 1959–60.

It is appropriate, now that these operations have ceased, to state that Southern Rhodesia owes a great debt of gratitude to the men who, always in the face of ill-informed criticism, carried out the work of game destruction and so permitted the agricultural development of many thousands of square miles of the lowveld. There was, until the recent appearance of better trypanosomiasis drugs and of residual insecticides, no other method which could be applied at reasonable cost; for bush clearing, except in limited areas where it was used very efficiently, was not a practicable technique under Southern Rhodesian conditions. Moreover, although the number of game shot since 1930 appears large, it is evident to those with a wide experience of game in Africa, that the damage to the Southern Rhodesian game population from anti-tsetse operations has been negligible. It is significant that already this year two complaints have been received, one from an African and one from a European area, of the menace to farming created by the influx of game consequent upon cessation of tsetse control shooting. It is hoped, during the coming year, to publish a full review of the game destruction campaign since its inception.

Distribution of Expenditure

A comparison of the following table with that given in last year's report reflects the change in emphasis from game destruction to other methods of control. The high figure for bush clearing is due to the cost of bulldozing in the Sabi area. As the table only covers the last complete financial year, it does not take account of the cost of the Nagupande–Mzola insecticide operation.

PERCENTAGE DISTRIBUTION OF COSTS BETWEEN DIFFERENT TYPES OF OPERATION

Type of Operation	Labour	Equipment Stores, etc.	Transport	Total
Bush clearing and control	16·7	77·8	3·1	50·0
Game destruction	14·8	1·4	9·9	6·9
Surveys and investigations	18·7	2·4	13·8	9·1
Insecticides, arboricides, etc.	3·2	6·4	6·4	5·5
Traffic control	8·9	0·9	3·7	3·9
Fences	9·0	0·4	6·8	4·1
Roads	12·5	0·3	8·3	5·4
Camp construction	3·6	3·1	5·5	3·5
Administration	9·8	3·2	28·8	6·8
Miscellaneous	2·8	4·1	13·7	4·8
	100·0	100·0	100·0	100·0

Conferences, Meetings and Courses

Mr. D. F. Lovemore was a member of the Federal Delegation to the Symposium on the Conservation of Nature and Natural Resources in Modern African States, held at Arusha, Tanganyika Territory, in September 1961.

In company with the Director, Mr. Ford attended meetings of the Working Party on the Joint Action Campaign against Tsetse-fly in South-East Africa at Lourenço Marques (November 1960) and at Victoria Falls (July 1961). A third meeting on this project was held at the Chipinda Pools Camp in August to enable details of the programme of the South African Pupa Survey Team to be discussed with local representatives of Southern Rhodesia and Moçambique.

Three Senior Field Officers and one Field Officer attended a Wild Life Conservation course at the University College of Rhodesia and Nyasaland in May.

Evidence was given on the tsetse and trypanosomiasis problem to the Land Planning and Conservation Working Party set up by the Southern Rhodesia Advisory Committee on African Agricultural Production.

The Southern Rhodesia Tsetse and Trypanosomiasis Control Committee has continued its valuable monthly sittings and local committees have sat at intervals in Fort Victoria, Urungwe and Chipinga.

Research Co-operation

A very fruitful activity has been our co-operation with various workers engaged in tsetse and trypanosomiasis research outside the Branch. A joint study has been started with Professor E. B. Edney, of the University College of Rhodesia and Nyasaland, on the micro-climates of *Glossina* resting sites. Tsetse pupae and strains of trypanosomiasis have been supplied to Dr. E. Bursell, also at the University College, for his work on *Glossina* metabolism and on the mode of infection of the salivary glands by *Trypanosoma brucei*. A strain of the latter trypanosome was sent to Dr. H. Fairbairn for culture studies at the University of Cape Town and during the year Dr. Fairbairn visited our Field Research Stations and was thus able to make his very wide experience available to our professional staff. Trypanosome strains and sera have also been supplied to Dr. L. O. C. Cookson, of the Medical Research Laboratory, for immunological studies, using the new fluorescent staining techniques.

Finally, under this head may be mentioned the tour of inspection, under the auspices of the Agricultural Research Council, of Dr. J. P. Glasgow, until recently Chief Entomologist of the East African Trypanosomiasis Research Organization. It is expected that Dr. Glasgow's report will provide the basis for the setting up of a number of new tsetse research projects by the Council.

Appendices

The usual tables showing returns from deflying points and numbers of game animals destroyed are given as appendices. In addition, three tables summarize the distribution of infected cattle, the results of blood smears and types of treatment.

PUBLICATIONS

Cockbill, G. F. (1961). Preliminary investigations on the use of a chemical brush-killer in controlling regrowth on the Eastern Border Clearing. *Rhod. Agric J.*, vol. 58, p. 173.

Ford, J. and Leggate, B. M. (1961). The geographical and climatic distribution of trypanosome infection rates in *G. morsitans* group of tsetse-flies. *Trans. R. Soc. trop. Med. Hyg.*, vol. 55, 383.

Leggate, B. M. and Pilson, R. D. (1961). The diurnal feeding activity of *Glossina pallidipes A.* in relation to trypanosome challenge. *Bull. ent. Res.*, vol. 51, 697.

Goodier, R. (1961). Discriminative bush clearing against tsetse in the south-east of Southern Rhodesia. *Rhod. agric. J.*, vol. 58, 262.

Goodier, R. and Phipps, J. B. (1961). A revised list of the vascular plants of the Chimanimani Mountains. *Kirkia*, vol. 1, 44.

The following papers are included in C.C.T.A. Publication No. 62, Report of the Eighth Meeting of the International Scientific Committee for Trypanosomiasis Research, January 1961:

Aspinall, K. W., Ford, J., Steel, W. S., Steele, B. and Swan J. F. C. The control of trypanosomiasis in the Federation of Rhodesia and Nyasaland.

Ford, J. The advance of *Glossina morsitans* and *Glossina pallidipes* into the Sabi and Lundi river basins, Southern Rhodesia.

Pilson, R. D. and Leggate, B. M. The diurnal activity of *Glossina pallidipes.*

Farrell, J. A. K. The control of a tsetse-fly (*Glossina*) advance by use of residual insecticide.

The following have been submitted for publication:

Cockbill, G. F. Further investigations on the use of a chemical brush-killer in controlling regrowth on the Eastern Border Clearing, Chipinga District.

Goodier, R. A note on blood feeding in *Philoliche* (*Dorcaloemus*) *silverlocki* Austen (*Diptera, Tabanidae*).

Simmonds, A. M. and Leggate, B. M. A survey method for trypanosome infection in *Glossina* (Muscidae, Diptera).

The following were presented at the C.C.T.A./I.U.C.N. Symposium on the Conservation of Nature and Natural Resources in Modern African States, Arusha, Tanganyika:

Lovemore, D. F. The effects of anti-tsetse shooting on the game population as observed in the Sebungwe District, Southern Rhodesia.

Ford, J. African wild life and the tsetse-fly-borne diseases.

ACKNOWLEDGEMENTS

As always, it is a pleasure to record the help received from the Tsetse and Trypanosomiasis Control Committee and various area committees; native commissioners, their staffs and officers of the Native Agricultural Department; the Federal Department of Topographical Surveys and the Southern Rhodesia Lands Department; the Central Mechanical Equipment Department; the Wild Life Conservation Department; the National Parks Department and many others. The interest shown in our work by the Natural Resources Board and by various local I.C.A. committees has been stimulating and valuable. It is a particular pleasure to record the unfailing interest and support given by those officers of the Federal Ministry of Agriculture who deal with our affairs.

Finally, to our new colleagues in the Veterinary Service and to my own officers, I am indebted for their loyal help and much hard work during the year.

AREA REPORTS

NORTH-WESTERN FRONT: TRYPANOSOMIASIS
(W. P. Boyt)

1. Binga Native District

The control of the disease in this district during the period under review was successful.

Antrycide fast strains of *T. congolense* appeared at two centres — Manjolo and Siansali. Both these centres are exposed to a fairly heavy challenge associated with the Lubu Valley. The sanative drug used was Berenil at 5 m.p.k. and its use at Manjolo was immediately attended by success. At Siansali the resistance had reached a higher plane and it was necessary to use Berenil twice, the second time ten days after Antrycide Pro-Salt, i.e. when the concentration of Antrycide was still high.

The method of assessing the efficacy of the sanative treatment was by the regular weekly smearing of individually identified, known positive animals, together with the 10 per cent. monthly smearing of the remainder. The cocktail treatment resulted in clean smears thereafter, both from the known cases and from the balance of the infected herds. These cattle have been under constant prophylactic Antrycide Pro-Salt treatment since they were first introduced into the area in 1957.

	October 1960	*October 1961*
Total cattle in the district . . .	6,141	6,757
Cattle on prophylactic treatment		1,269
Cattle on curative treatment		5,488

Smear Summary

Smears	*Positive*	*T. congolense*	*T. vivax*
6,544	133	87	46

Treatment Summary

Cattle Treated	*A.D.M.S.*	*A.P.S.*	*Berenil*
14,352	5,262	6,728	2,362

2. Lupane Native District

Two new centres of infection, Tjotjolo South and Nduna, were noted during the year.

At Nduna three kraals were infected, with a total of seven cases in March. One further case was recorded in April. Berenil was used to eliminate the infections and there have been no further cases. This centre is on the main Bulawayo–Victoria Falls road.

The infections at Manganganga have persisted since their first appearance in February 1960, and have increased in number. The death rate here is high, but the picture is complicated by a concurrent hookworm infestation.

Some trouble was experienced with civil disobedience in the district, but a couple of prosecutions and the timely intervention of Chief Mpikwa restored the situation.

Throughout the area there has been a swing from *T. vivax* to *T. congolense* infections, despite the use mainly of Antrycide D.M.S.

	October 1960	*October 1961*
Total cattle in district . . .	9,590	10,050

The increase of 460 is effected by the addition of 1,614 head at the two newly infected centres. Thus the centres recorded in 1960 show an overall decrease of 1,154. This figure is not, of course, a death rate due entirely to trypanosomiasis or any other disease. Deaths have, however, been frequent and some 21.3 per cent. (176 head) have died at Manganganga since June. There seems little doubt that trypanosomiasis and hookworm at the height of the dry season have played a major part in this epidemic.

Smear Summary

Smears	*Positive*	*T. congolense*	*T. vivax*	*Mixed*
6,544	178	109	66	3

Treatment Summary

Cattle Treated	*A.D.M.S.*	*A.P.S.*	*Berenil*
10,400	10,152	—	248

3. Gokwe Native District

The year was notable for quite heavy rain, 28–30 in., which at times curtailed the work and rendered travelling difficult.

The disease incidence rose during the year in the North-Eastern and Lutope Forest areas. In the former, there was an extension of grazing grounds further into the Gwave–Tare–Sessami triangle, where a survey indicated the presence of tsetse with the high trypanosome infection rate of 36 per cent. It is difficult to understand how stock have existed, free from heavy infection, under such trypanosome risk with a three-monthly Antrycide Pro-Salt régime. During September the routine was changed to a two-monthly block inoculation of all cattle in the area. Similarly, at Ngomeni and Sevens, in the Lutope Forest area, the cover will be increased to a two-monthly pro-salt régime.

A meeting was held at Nemangwe with officers of the Department of Native Agriculture to consider a future programme for the area development. It is hoped that such liaison will become a regular feature of all future development in trypanosomiasis areas. With particular reference to the extension of a livestock economy in the North-Eastern area, no decision was reached because of disagreement regarding the stocking rate, which is to be reassessed. The department cannot guarantee protection of livestock in a trypanosomiasis area unless primary facilities by way of communications, etc., are adequate throughout the year. The new road into the area of proposed settlement north of the Mdzonkwe River promises to be impassable during the wet season and the most that can be expected for the time being is a test herd to indicate the risk of infection. South of the same river, in the Umniati area, all herds remained clear and there were indications that some cattle actually graze to the north of the Mdzonkwe.

Elsewhere in the Gokwe Native District little change was noted. Large game roam at will in the heavily infected areas and there were constant reports of elephant and buffalo in the North-Eastern and Lutope areas. With the increased pressure and therapeutic cover necessary in these two areas, it will be necessary to station another Animal Health Inspector in the district during 1961–62. Kana tanks 6, 7 and 8 can then be removed from the Binga Inspectorate.

	1960	*1961*
Total cattle in infected areas .	9,446	10,686
Cattle on prophylactic treatment		853
Cattle on curative treatment		9,833

Smear Summary

Smears	*Positive*	*T. congolense*	*T. vivax*	*T. brucei*
3,054	109	96	10	3

Treatment Summary

Cattle treated	*A.D.M.S.*	*A.P.S.*	*Berenil*
5,930	3,259	2,142	529
Donkeys treated 834	782	—	52
Totals 6,764	4,041	2,142	581

NORTH-WESTERN FRONT: TSETSE
(D. F. LOVEMORE)

1. SEBUNGWE (Binga, Gokwe and Lupane Native Districts)

(i) *The Nagupande Residual Insecticide Spraying Operation*

In view of the success achieved in the Maseme discriminative spraying operation, it was decided that the next step in this new anti-tsetse-control approach in Southern Rhodesia should be a large-scale operation, since it was obvious that the larger an area one could tackle at one time, particularly if it could cover an entire drainage unit, the greater would be the chance of complete eradication over that part of the area furthest away from reinvasion. It was with this in mind that the Nagupande operation was carried out.

The area chosen for the experiment lies between latitudes 18°03′ and 18°30′S. and longitudes 27°15′ and 27°47′E. The river systems involved were the entire Nagupande (for descriptive convenience the Nagupande is that section of the Mlibizi drainage above the Nagupande/Manyande confluence), the Manyande other than the Tende tributary, the Chebira spring drainage (a tributary of the Busi), the entire Mzola, downstream from the eastern end of Cewali pan, and that section of the Shangani two miles either side of the Mzola/Shangani confluence. Some of the tributaries which drain through the Situmbas escarpment into the Lubu Valley were also sprayed. The total area covered by the operation was approximately 1,000 square miles.

The reason for choosing the Nagupande–Manyande–Mzola area was the deteriorating trypanosomiasis situation of the Mzola–Kana–Shangani African settlement and the European-owned Karna Block Ranch areas lying to the south. It was considered that this situation was directly related to the tremendous tsetse pressure from the high-density *G. morsitans* area of the Nagupande headwaters (Siatinde, Mkotakota, Kawindi and Bemsee rivers) and that until this could be reduced, and reduced quickly, there would be no improvement. (There is considerable evidence that *G. morsitans* has been crossing the *Baikiaea–Brachystegia* wooded Kalahari sand plateau, commonly known as the "Makulugusi", from the Nagupande headwaters to the Dongamusi headwaters, a tributary of the Mzola. The carriage of tsetse by traffic, particularly cyclists, from the Nagupande headwaters area and from the marginal tsetse area of the Mzola and Dongamusi has also played no small part in this problem.) It seemed that discriminative application of a residual insecticide was a likely means of achieving this. It was thus possible, as in the Maseme operation, to combine experimental work with control.

Preparations for the operation involved the compilation of a controlled map (scale 1 : 40,000) from aerial photographs showing drainage lines, existing roads and tracks and potential *G. morsitans* dry-season habitat, the development of 141 miles of access track and the reopening up of 37 miles of abandoned tsetse operations track (there were already 246 miles of road and track in a good state of repair in existence in the area), the setting up of two traffic control points and the laying out of six bicycle fly-rounds and 18 ox fly-rounds (there were already 13 bicycle fly-rounds in existence when preparations began).

The spraying was carried out during late June, July, August and early September 1961.

Spraying was discriminative, being based on the knowledge that *G. morsitans* concentrates during the late dry season on specific vegetation types. In Sebungwe these are particularly the associes of the vlei edge, the drainage lines, the "gusi"/mopane contacts and the *Brachystegia–Julbernardia* woodland/mopane contacts. ("Gusi" is the vernacular name for the *Baikiaea plurijuga* other spp. woodland of the Kalahari sand areas). Roads and tracks, which are known to be attractive to *G. morsitans*, particularly at those points where they cross drainage lines, were also included in the spraying programme.

The sites of application of the insecticide were generally the same as in the Maseme operation except that, in the light of certain results achieved in that operation, namely the complete collapse of tsetse in the untreated "control" areas lying within the operation area (a phenomenon attributed to movement), it was decided to dispense with the selective spraying of such sites as the tree and termite mound clumps occurring on vleis, rock crevices, ant-bear holes, overhanging banks and the underside of fallen trees, and the block spraying of heavy riverine areas around waterholes, and to rely instead on "band" spraying of the specific vegetation types and of course the roads. It is unfortunate that, due to the general shortage of professional staff prevailing, it was not possible to carry out

investigatory work on resting sites during the extreme dry season period between the Maseme and Nagupande operations, namely September to October 1960, for it might then have been possible to confirm or negate this approach. The economic aspect also weighed heavily in favour of "band" spraying.

Details of sites of application are as follows:

(a) Edges of vleis, "gusi"/mopane contacts and *Brachystegia–Julbernardia* woodland/mopane contacts were sprayed with two machines on "edge, plus 20 to 30 yards inside; boles only from 0 to 15 ft." basis and the occasional very likely looking overhanging branch was also normally sprayed.

(b) Drainage lines were sprayed with two machines either side, working from 10 to 20 yards apart, except where extensive riverine occurred, when four machines were used, all on a "boles only from 0 to 15 ft. and thicket" basis and the occasional very likely looking overhanging branch was also sprayed.

(c) Roads and tracks were generally sprayed with one machine either side on an "edge only, boles only from 0 to 15 ft." basis. There were, however, a number of exceptions to this procedure.

The personnel were divided up into six "drainage line" teams and two "road" teams. Each "drainage line" team consisted of one European in charge, eight African operators, eight insecticide "carriers" and two fuel "carriers". The road teams consisted of one European in charge and five operators for the one team, and one Senior African Field Assistant in charge and five African operators for the other team.

There were 40 Schefenacker, motor-powered, low-volume, mist sprayers available for the operation. It was thus possible to issue each "drainage line" team with five machines (four working and one spare) and the "road" teams with three machines (two working and one spare). The balance of four machines was kept in reserve at the central workshop.

Two separate Shell Dieldrin formulations were used in the operation, namely the original "Dieldrex 15" (18.6 per cent. dieldrin by weight), a quantity of which remained from the Maseme operation, and the special new tsetse formulation "Dieldrex 15 T" (18.55 per cent. dieldrin by weight). Both formulations were diluted with river water in the proportion of 1 : 4 giving, in the case of the former, an emulsion containing 3.72 per cent. dieldrin and, in the case of the latter, an emulsion containing 3.71 per cent. diedrin.

A total of 28,291 gallons of the insecticide emulsion was applied to potential resting sites of *G. morsitans* throughout the area over 3,489 machine miles. The application rate was therefore 8.06 gallons per machine mile. The application rate from day to day was generally very constant.

The cost of the operation, including all the preparatory work on the basis of insecticide used, machine running costs, labour, transport, road equipment and some miscellaneous items, was £23,500. (European officers salaries are excluded.)

It is too early as yet to assess the results of the operation. It is sufficient to say that events are proceeding as expected, namely that we are now in the midst of the very hot, dry, unfavourable period, that the tsetse are concentrated on the associes of the vlei edge, the drainage lines, the "gusi"/mopane contacts and the *Brachystegia–Julbernardia* woodland/mopane contacts, that the insecticide remains lethal, as shown by laboratory tests and that fly-round and traffic control results indicate a downward trend.

(ii) *The Maseme Residual Insecticide Spraying Operation*

The fly-rounds covering the Maseme spraying operations area have been carried out regularly throughout the year. Results indicate that, following the very satisfactory reduction achieved (between 98 and 100 per cent.), the tsetse population has made a partial recovery over the greater part of the area (to a level of between 5 and 20 per cent. of the original), with an almost complete recovery in the Maseme Spring, Chicomba and Dett rivers watershed area. It is suggested that the carriage of tsetse by traffic could have been partly responsible for the more rapid recovery in this latter area, for it is traversed by the main Kariangwe–Lusulu road and also by several "native" paths leading from the Dobola settlements in the south to the Lubu Valley. A more diffuse dry season tsetse habitat is another likely factor, the implication here being, of course, that possibly insufficient of the habitat was treated. It is of interest to note that the tsetse population in this area proved to be particularly resilient during the 1957 aerial smoking operations.

(iii) *Aerial Smoking Campaign (1957): Lubu Valley*

The tsetse population remains at a low level and, in fact, if anything, has decreased (catches on the Lubu fly-round are particularly pleasing).

The density of African settlement within the Lubu Valley continues to increase.

(iv) *Hunting Operations*

In accordance with the decision made just after the end of the last reporting year and intimated in the last annual report, the hunting operations were terminated at the end of October 1960 and 1,136 game animals were destroyed during this last month of hunting.

(v) *Game Movement Control Operations*

In order to control a possible rapid movement of game animals, particularly the larger game animals, back into the old hunting area and to discourage game movement generally, the game fence has been maintained and its effectiveness has been increased by shooting any animal found on the actual fence line. The fence is patrolled regularly by African guards. Only one rifle and a limited number of rounds of ammunition are issued to each pair of guards. Forty-seven game animals were destroyed during these operations.

Elephant control has been continued throughout the old shooting operations area in order to maintain the elephant-free situation previously achieved and 12 elephants were shot.

An elephant control operation was carried out in the Mlibizi–Siazundu rivers area by officers of the departments of Wild Life Conservation and National Parks at the request of this department, the object being to break the east–west movement of elephant in this area, and 43 elephant were shot.

(vi) *Traffic Control*

Five traffic control points were operated throughout the year, namely Natulwe Gate, Siambola Gate, Lubimbi Gate, Mzola Gate and Sefula Gate. Gokwe Gate, which was originally controlled by the Sebungwe administration, now comes within the Sanyati–Gokwe administration. It was also found necessary to open two further traffic control points preparatory to the Nagupande spraying operation, mentioned above, namely Muzaze Gate and Kawindi Gate. The object of the former was to cleanse traffic entering the sprayed area from the north and Kawindi Gate was set up when it was found that the new Kawindi track had accentuated the "carriage of tsetse by traffic" problem towards the Mzola.

(vii) *Cattle Control Fence*

The cattle fence was maintained efficiently throughout the year.

Following the decision to open the area along the Mzola between Cewali pan and Karna Block Ranch for settlement with cattle, a paddock extension to the cattle fence, which will enclose the settlement area, is now in the course of construction. The planning and cutting of the fence line was carried out as a joint exercise by the Forestry Commission and this department (the fence line is on the Mzola Forest Area boundary) and the erection of the fence is being carried out by the Native Affairs Department.

(viii) *Survey and Tsetse Distribution*

A total of 6,000 square miles of controlled mapping, at a scale of 1 : 40,000, was done during the year; this covers sections of the Binga, Wankie, Lupane and Gokwe Native Districts.

Survey was restricted to the Nagupande spraying operations area.

The old shooting operations area bicycle fly-rounds continue to provide a month-to-month picture of tsetse distribution along the Sebungwe section of the Zambezi front. It is disconcerting to note that the Malimasimbi group of fly-rounds indicates a considerable build up of *G. morsitans* on the Sengwa and Lutope rivers. There has been a consequent deterioration in the trypanosomiasis situation in the adjacent cattle areas, namely Ngomeni, Samnyanga, Sevens and the Lutope–Lufusi settlement areas.

(ix) *Roads, Tracks and Airstrips*

About 500 miles of roads and tracks were maintained.

An airstrip was constructed near the Lusulu Trypanosomiasis Experimental Station.

(x) *Building*

Building work has continued throughout the year at the Lusulu Trypanosomiasis Experimental Station. Two rondavel-type buildings for visitor accommodation, a two-roomed extension to the Animal Health Inspector's Terrapin house, ten houses for African microscopists, cattle guards and field assistants, and a sheep-pen have been built.

2. SANYATI-GOKWE (Gokwe Native District)

(i) *Hunting Operations*

Hunting operations were terminated at the end of November 1960 and 535 game animals were destroyed in the last two months of hunting.

(ii) *Game Movement Control Operations*

As in Sebungwe, an attempt is being made to prevent an excessive movement of game animals back into the old shooting operations area by using the game fence as the deterrent. The organization of the staff is exactly the same as described for Sebungwe. One hundred and forty game animals were destroyed on this control work.

A limited amount of elephant control also continues, the object being to prevent the west–east movement of elephant towards the Sanyati River. Shooting is carried out to a depth of five miles from the fence on the Sanyati side of the fence. Only three elephants were shot.

(iii) *Traffic Control*

Eight *G. morsitans* were taken off south-bound traffic at the Gokwe Gate.

(iv) *Survey and Tsetse Distribution*

A most useful vegetation map (scale 1 : 40,000), covering the Charama Plateau, the Sessami and Bumi headwaters and the Ungwe–Mzonkwe rivers, was prepared by Mr. Farrell.

Considerable progress has been made during the year on surveying the tsetse front in this area. The use of bait animals has greatly facilitated the work. *G. morsitans* were found to occur in medium to light density in the Gwave and Tare rivers — Inyoka Estates area, along the northern side of the Charama Plateau and on the Gokwe–Gorodema road between the Sessami and Bumi rivers. The situation elsewhere in the area remains more or less as previously reported, excepting possibly for the Nembudzia–Mtungi area (Umvumvudzi headwaters), where it seems that the "fly-line" extends further south than was previously thought. A 12-day survey of the proposed Ungwe–Mzonkwe resettlement area gave negative results.

Twenty bicycle fly-rounds have been laid out along the tsetse front in the Sanyati section of the area from Gorodema to Ganderowe. Catches are due to start at the beginning of October and will be carried out twice monthly. It is hoped to connect this system with the Sebungwe system during the coming year.

(v) *Trypanosome Infection Rate Surveys*

Two trypanosome infection rate surveys were carried out, the first during July in the Gwave/Tare area and the second during August in the Machichiri area of the Umvumvudzi River. The infection rate obtained in the former survey was 36.3 per cent. (132 *G. morsitans*) and in the latter 13.6 per cent. (250 *G. morsitans*). It is of interest to note that domestic stock are present in the Gwave/Tare area, whereas only game animals occur in the Machichiri area.

(vi) *Roads and Tracks*

Thirty-five miles of new track were cut and about 200 miles of roads and tracks were maintained.

(vii) *Building*

A new office, storeroom and three field assistants' houses were built during the year.

ZAMBEZI FRONT — CENTRAL: TRYPANOSOMIASIS
(W. P. Boyt)

1. Urungwe Native District

European Farms

In view of the absence of infection in the Urungwe Reserve, it was decided to relax to some degree the intensive monthly inspections.

Three cases occurred, one in each of three farms, in the Karoi district. Such isolated cases inevitably occur from time to time in areas adjacent to a known tsetse-infested area.

African Areas

Urungwe Reserve. The scheme for stocking the reserve in view of the absence of infection in the trial paddock herd was approved and four test herds of 25 head of cattle each were established at strategic points at Karreveshi, Tengwe, Zimonga and Marogovo. None became infected.

As an additional incentive to immediate restocking of the eastern part of the reserve, cattle were purchased out of N.A.D. funds to be sold to the local Africans. This plan was received with enthusiasm by all concerned and the final result was hoped to be a model for all future exercises of a similar nature. The breeding stock, however, was not up to a high standard and considerable difficulty was experienced with administration details at local level.

CATTLE IN THE INFECTED AREA

Paddock	929
Test herds	202
Miami	1,879
Total	3,010

Smear Summary

Smears	*Positive*	*T. congolense*
4,992	3	3

Treatment Summary

Inoculation	*Berenil*
13	13

2. Darwin Native District

Of the three infected areas, Chiswite, Mazarabani and Chimanda Reserves, only the last-named returned cases during the year.

Infection first appeared at Bopoma in January and at Nyakaronga in March and April. Treatment of the infected kraals with Berenil obliterated the infection, and no further cases were recorded. The only previous cases noted were at Bopoma in May 1959.

TOTAL CATTLE IN THE INFECTED AREAS

Chiswite	7,707
Mazarabani	958
Chimanda	11,924
Total	20,589

Smear Summary

Smears	*Positive*	*T. congolense*	*T. vivax*
5,516	19 (Chimanda only)	16	3

Treatment Summary

Inoculations	*A.D.M.S.*	*Berenil*
65	28	37

ZAMBEZI FRONT — CENTRAL: TSETSE

(D. F. LOVEMORE)

1. URUNGWE (Urungwe and Kariba Native Districts)

(i) *Hunting Operations*

Hunting operations were terminated at the end of November in Urungwe West and at the end of December in Urungwe North and East. 628 game animals were shot during the last months of hunting in the two areas (218 in Urungwe West and 410 in Urungwe North and East).

(ii) *Game Movement Control Operations*

Game movement control operations are being carried out in Urungwe North and East, using the game fence as the deterrent. The organization is similar to that of the Sebungwe and Sanyati operations described above. The object of the exercise is to control excessive game movement from the game areas in the north back into the reclaimed areas to the south. Game pressure is particularly heavy along that section of the fence lying between the rising Kariba Lake and the escarpment. Elephants are also controlled, by shooting those which are found within five miles of the game fence on the south-eastern side. Ninety game animals and 14 elephants were destroyed in these operations.

(iii) *Traffic Control*

There were four traffic control points in operation throughout the year, namely Chiroti, Manyangau, Makuti and Chirundu. Traffic control at Kariba was taken over from the Power Board at the beginning of August. Ten *G. morsitans* were caught at Chiroti Gate off east-bound traffic and *G. pallidipes* were recorded at Manyangau, Makuti and Chirundu. Catches at the Kariba check point are high, both *G. morsitans* and *G. pallidipes* being recorded.

(iv) *Survey and Tsetse Distribution*

(a) *Urungwe West.* Extensive surveys with bait oxen have been carried out in the area bounded by the Urungwe Native Reserve on the east, the Sanyati on the west, the Zambezi Escrapment in the north and the Tengwe River in the south. *G. morsitans* was found to occur in low density along the lower Kanyati and Chiroti rivers and on the Urenge system. Elsewhere results were negative.

Thirty bicycle fly-rounds have been laid out in the Urungwe West area from the Zambezi Escarpment in the north to the Piriwiri River in the south. Patrols have only recently commenced, being carried out twice monthly.

(b) *Urungwe North and East.* A system of 20 bicycle fly-rounds was laid out during April along the presumed tsetse-front in the area between the Rekomitjie River and Kariba. Patrols, which are carried out twice monthly, began in May. A picture of the tsetse distribution is already beginning to emerge. The records of *G. morsitans* in the Nyamakati–Rekomitjie area, which lies some fourteen miles south-east of Makuti and along the upper Charara system, are of particular significance. This system is to be extended eastwards towards the Chewore River.

(v) *Roads and Tracks*

Considerable efforts have been made to open up the Urungwe North and East area with tracks and the greater part of the labour funds has been spent on this work. Forty miles of new track have been cut, 135 miles of old track reclaimed and 270 miles of road and track maintained.

2. NORTH LOMAGUNDI (Lomagundi and Sipolilo Native Districts)

The generally satisfactory situation in the Doma and Sipolilo areas has continued. In view, however, of the extension of both European and African settlement in these areas towards tsetse-infested country, it has become necessary to increase the surveillance of the tsetse front. The first requirement was to build a more permanent camp at Chenanga, which lies north of Doma, for the resident field officer; this has been done. The next step will be to organize regular tsetse patrols. It is also planned to station another officer in the Dande area, which lies east of the Hunyani River below the escarpment. A camp will be built during the coming year.

Two hundred and one miles of road and track were maintained during the year.

NORTH-EAST FRONT: TRYPANOSOMIASIS
(W. P. Boyt)

1. Mtoko Native District

Chikwizo Reserve

There was an increase in the number of infections in this zone. With a suspicion of antrycide-fast strains of *T. congolense*, a switch was made to Berenil as a sanative and then to Ethidium as a routine curative. This latter drug proved most useful, giving a minimum of three months' freedom from infection under conditions of medium challenge.

Mtoko Reserve

Reinfection at Masunzwa centre occurred in May, the first since 1952. No cases were recorded after June.

Special Native Area "C"

The first cases appeared here since the reintroduction of cattle in 1959 but, on the whole, the trial has gone well. There seems little doubt that restocking can now proceed, the indications being that cattle could be maintained by the use of drugs.

CATTLE IN INFECTED AREAS

Chikwizo	1,009
Mtoko Reserve	6,861
Special Native Area "C"	182
Total	8,052

Smear Summary

Smears	*Positive*	*T. congolense*	*T. vivax*	*T. brucei*
2,348	177	145	30	2

Treatment Summary

Inoculations	*Berenil*	*Ethidium*
2,458	1,371	1,087

2. Inyanga Native District

The position here deteriorated badly. Chimsasa and Fombe, and later Chifambe and Matisi all showed a very heavy infection. The first two named were placed on a two-monthly prophylactic régime of Antrycide Pro-Salt. The position at Chifambe and Matisi is under review. At the latter, civil disobedience led to refusal of diagnostic or therapeutic measures. As a result, there were some 200 avoidable deaths.

Holdenby Special Native Area

Infection was low, there being only 12 cases in all. Civil disobedience occurred at Mandeya, the position being restored after prosecutions.

TOTAL CATTLE IN INFECTED AREA

Inyanga North	9,795
Holdenby	3,237
Total	13,032

On prophylaxis 1,353; curative 11,679.

Smear Summary

Smears	*Positive*	*T. congolense*	*T. vivax*
1,702	155	119	36

Treatment Summary

Inoculations	*A.D.M.S.*	*A.P.S.*	*Berenil*
10,527	5,036	954	4,537

3. Umtali Native District

Burma Valley

Ten cases occurred on six European farms. Until September, these were confined to the valley proper, adjoining the Portuguese East African border, but in that month four cases were diagnosed on the farms Fangudu and Bomponi, to the north of the valley in the Vumba Range at an altitude of 3,500 ft.

NORTH-EAST FRONT: TSETSE

(G. F. Cockbill)

1. Mtoko and Inyanga North Native Districts

Mtoko and Inyanga North

For many years cattle trypanosomiasis has been enzootic in the kraals Fombe and Chimsasa, but no tsetse had been found in these areas of Inyanga North. Occasional visits were paid by entomologists, veterinarians and field officers, when somewhat cursory inspections were made for likely tsetse habitat. The results always indicated that no tsetse could be found in those localities where they might be expected. During the year under review, in the face of persistent and increasing incidence of trypanosomiasis in the Fombe and Chimsasa cattle, a determined effort was made to discover the origin of these outbreaks.

A new camp was built on the north bank of the Ruenya River, adjacent to the international border, and a field officer installed, with a special undertaking to make an ecological investigation of the drainages in Inyanga North which feed the Ruenya and Gairezi rivers. With the help of aerial photographs, adequate maps are being prepared and likely habitats identified. Trained African field staff, under European supervision and using bait animals, have carried out extensive patrols along the drainages and along the new tracks which have been opened up. Considerable success has attended these efforts. Since June 1961, when intensive searching began, 124 *G. morsitans* have been caught within the feeding and watering area of the Fombe cattle. Localities such as the Nyatisangu and Nyatikungu rivers have been identified as places where *G. morsitans* can be taken regularly in small numbers. The conviction is growing that captures of *G. morsitans* in this area are associated with the occurrence of rocky outcrops, reminiscent of the situation found in the Sabi Valley, where regular captures of G. *morsitans* could be made within *Brachystegia tamarindoides* woodland on rocky outcrops. This survey work is continuing.

North of the Ruenya River the situation has changed little. Cases of trypanosomiasis have been reported within the Mtoko Reserve, associated with the Nyamarere and Nyaderi rivers and at Chimkoto on the Nyagoko River within Special Native Area "C". In the Chikwizo Reserve, trypanosomiasis persists, but is kept under control by drugs.

Patrols with bait oxen have been carried out along the Mudsi and Nyansansara rivers, which have long been regarded as the source of tsetse that give rise to cattle trypanosomiasis within the Chikwizo Reserve. It is likely that *G. morsitans* extends along these rivers from its main habitat in Moçambique. A few *G. morsitans* were caught on the Nyansansara as far west as the Makaha Chamber. The presence of tsetse in this locality might explain the occasional capture of tsetse on east-bound traffic at the chamber.

Hunting operations were suspended in June to allow the labour to concentrate on cutting a 100-yard-wide clearing along the eastern game fence between the Mazoe and Ruenya rivers. 1,180 animals were killed during hunting operations, of which 908 were vermin, duiker or smaller animals.

SOUTH-EASTERN FRONT: TRYPANOSOMIASIS
(W. P. Boyt)

1. Melsetter Native District

There were three cases in all. Two occurred in August on Nyambamba Farm, which is associated with the Lusitu River drainage. The other appeared in January on Silverstreams Estate, far up the drainage system of the same river, but in an animal which had come from the Sabi. The true origin was, therefore, doubtful.

2. Chipinga Native District

The European farms along the Moçambique border returned 103 cases, almost double those of last year. This does not indicate a serious problem. 1959 was an exceptional year and the cases were at a low level. The year under review followed more the customary pattern, with a seasonal decline at the end of the year.

In the African areas control was marred by widespread civil disobedience. Diagnostic and control routine was virtually at a standstill in Musiquavanthu Reserve for a whole year. It was hoped that a spate of deaths would bring the owners to their senses, but the incidence of the disease at most centres fell away at the end of a severe dry season with very cold spells. This lent credence to the politically inspired propaganda which instigated the incidents and the affair was only brought to an end by wholesale prosecutions in August and September.

The attitude in the Sabi Division Native Purchase Area was somewhat different. Here the owners are well used to the disease and its effects, and it was not until July that they refused routine attention at Mwangazi. This may turn out to be a most serious matter in that a resistant strain was found at the dip at this time and as sanative treatment was refused the strain may, by now, be difficult to eliminate.

At the beginning of the year (October–January), eight cases were diagnosed at Sabi Tanganda Estates but, with treatment, they disappeared and there has been no recurrence to date. These cases were noteworthy for the extreme virulence of the *T. vivax*, which killed cattle in good condition in a matter of days and is reminiscent of the Humani and Matibi II strains of that organism.

The stock figures again showed an upward trend.

Total cattle at the infected centres	22,753
On prophylactic treatment . .	4,624
On curative treatment . . .	18,129
Total .	22,753

Smear Summary

Smears	*Positive*	*T. congolense*	*T. vivax*
2,314	338	229	109

Treatment Summary

Inoculations	*A.D.M.S.*	*A.P.S.*	*Berenil*
34,462	4,693	23,715	6,054

3 Ndanga Native District

In both Sangwe and Ndanga East Reserves a small number of cases (30 in all) reflected the usual picture of a low-grade sporadic challenge which was easily controlled by kraal inoculation.

Lone Star Ranch

Five cases were recorded in African-owned stock grazing on the Chiredzi River. Stock control on this ranch is not all that could be wished and these cases are not considered to be significant of any tsetse incursion.

Total cattle in the infected area . 8,373

All are on curative treatment.

Smear Summary

Smears	*Positive*	*T. congolense*	*T. vivax*
2,180	35	3	32

Treatment Summary

Inoculations	*A.D.M.S.*	*A.P.S.*	*Berenil*
2,292	2,292	—	—

4. Bikita Native District

On Humani Ranch, following the insecticide spraying, the incidence of infection declined but did not disappear. Most of the 49 cases were recorded from the Homestead Dip, but a rather disconcerting feature was the first occurrence of cases some ten miles up the Turgwe River drainage system. Control necessitated 774 doses of Antrycide D.M.S.

On Devuli Ranch, "A" Section, the three dips returned a total of 12 cases of trypanosomiasis, the last being in December. One lone case appeared at the Homestead in May.

On the Msapas extension of Devuli, the usual seasonal exodus of stock took place in January, but cases occurred monthly after the return in June. 3,767 doses of A.D.M.S. were dispensed and 921 smears were examined, of which 38 were positive—6 *T. congolense*, 29 *T. vivax* and 3 mixed infections.

5. Nuanetsi Native District

Matibi No. II Reserve

Infection was recorded throughout the year. In May, the stock at Chibgwedziwa was divided, with the commissioning of a new dip at Chambuta. The cases at this centre reached a high level in July–August and a block inoculation was carried out to relieve the situation. The increase in infection seems to result from or coincide with much elephant activity along the Tshingwedzi River.

Total cattle in infected area . . 2,134

All are under curative treatment.

Smear Summary

Smears	*Positive*	*T. congolense*	*T. vivax*	*Mixed*
1,280	68	5	60	3

Treatment Summary

Inoculations	*A.D.M.S.*	*Berenil*
2,312	2,233	79

SOUTH-EASTERN FRONT: TSETSE

1. Chipinga Border Clearing (G. F. Cockbill)

The patrol system, using bait oxen and a bait pig, has been maintained and extended. It is gratifying to record that one *G. brevipalpis* has been recorded on the Mselezwe River, within the European farming area, using bait oxen. This area has a long history of cattle trypanosomiasis but no tsetses have been found prior to this capture. A detailed tsetse survey will be carried out in this drainage area to provide data on which to devise suitable control measures.

The cutting of regrowth continues. A successful and uneventful burn was obtained over most of the Border Clearing. A local farmer cleared about 400 acres, using a bulldozer and blade. Regrowth has arisen from the portions of the plants left in the soil. He also cleared 30 acres, using a root cutting machine, which promises to be more effective in preventing regrowth. Other farmers have also begun control measures on that part of the original clearing no longer slashed by the Department. This is a most gratifying development.

Trials in the control of woody vegetation by chemical means, using the butyl esters of 2, 4–D and 2, 4, 5–T, were concluded and the results presented for publication. It was found that a 6 per cent. mixture of the butyl esters of 2, 4–D and 2, 4, 5–T in water applied to the foliage or to freshly cut stumps of *Pygeum africanum,* to the freshly cut stumps of *Lantana camara* and to the foliage of *Vernonia ampla* and of *Vangueria esculenta* gave satisfactory kills.

A second application of 6 per cent. 2, 4–D and 2, 4, 5–T in lighting paraffin to the cut stumps and to the frilled bark of trees, which survived the first application, resulted in the death of the following species:

(a) *Applied to Cut Stumps*

Botanical Name:	*ChiNdau Name:*
Afrormosia angolensis	Chiyanga
Antidesma venosum	Murongamunyu
Brackenridgia zanguebarica	Muminu
Hymenocardia acida	Chiswati
Piliostigma thonningii	Musekesa
Uapaca kirkiana	Muzhanje

(b) *Applied to Freshly Frilled Bark*

Botanical Name:	*ChiNdau Name:*
Brackenridgia zanguebarica	Muminu
Dombeya rotundifolia	Mpundururu
Markhamia acuminata	Mupfeya
Uapaca kirkiana	Muzhanje

This information is receiving practical application in the recently undertaken clearing of part of Tamandayi as an anti-tsetse measure.

2. The Sabi Area (R. Goodier and W. H. M. Nash)

(i) *Sabi East*

The African-owned cattle in the Mwangazi-Muumbe area of the Sabi Native Purchase Area, close to the Moçambique border, have long been subject to a high incidence of trypanosomiasis, the reason for which became evident when specimens of *Glossina pallidipes* were caught in the centre of the area only three miles south of Mwangazi Dip Tank in July and August 1960. It was therefore decided, in consultation with the Native Department, to commence a reclamation scheme in this area, based on the use of mechanical bush clearing, once the bulldozer team had completed its work in the area to the south of the Lundi River. The vegetation of the area was mapped by Mr. Farrell in 1960 and these maps and subsequent surveys led to the decision to initiate the scheme by clearing the vegetation favoured by tsetse to a depth of approximately five miles from the border southwards from the Mwangazi Gap to the northern edge of the basalt zone just to the south of Mjenani. The vegetation to be cleared was, in the first place, the *Brachystegia tamarindoides* woodland, known to be favoured by tsetse in the south-eastern tsetse belt and in which the *G. pallidipes* catches had been made, and then secondary thicket in the same area, which was also judged to be suitable for harbouring tsetse. Plans were also made for the construction of a border cattle-fence to prevent the cattle from the cleared areas from straying into the adjacent uncleared country in Moçambique. It is also intended to undertake limited insecticide spraying operations in the country immediately to the west of

the cleared areas. Work on this reclamation scheme commenced in July and, by the end of September, 1,850 acres had been felled. Owing to the broken nature of the country, the work of the bulldozers has to be supplemented by hand clearing on rocky outcrops. In this work as many trees as possible are ring-barked, and 362 acres have been completed.

The hand-labour clearing programme near the Msaswe River drainage on the southern front of the basalt zone, which was commenced in May 1960, was completed in December 1960, a total of 910 acres of *Brachystegia tamarindoides* woodland and thicket having been cleared from ridges at an average cost of 13s. 6d. per acre. The total cost was £616.

An outbreak of trypanosomiasis occurred amongst cattle on the Sabi–Tanganda Estate in November, five cases of *T. vivax* infection being discovered. Surveys failed to reveal the presence of resident tsetse in the area, although areas of the estate close to the Sabi River were considered suitable for infestation by *G. pallidipes*. No subsequent cases of trypanosomiasis have been reported.

Dotts Drift camp was reopened in June and will now be the main camp for the Sabi East area, as it is more conveniently situated than the Hippo Mine camp for the work in hand. The Hippo Mine camp will, in future, only be maintained as a base for survey hands and as a patrol camp.

A survey team from South Africa visited Hippo Mine in July to undertake tsetse pupae surveys in the area. This visit resulted from an offer by the South African Government to explore the possibilities of using techniques developed some years ago in Zululand. The team is still at work, its programme also including a visit to the tsetse front in Moçambique. The opportunity has been taken, by consent of the officer-in-charge, of enabling our field staff to work with and so learn the techniques used by the South Africans.

(ii) *Sabi West*

(a) *The Chiredzi–Lundi Section.* The Chiredzi–Lundi bush-clearing scheme, which was commenced in August 1959, came to an end in June 1961 with the completion of the hand clearing on the Lundi River and its tributaries in the vicinity of Chipinda Pools.

The hand felling and stumping of the heavy riverine vegetation on the Chiredzi River within the boundaries of Lone Star and Hippo Valley Ranches, which could not be cleared by the bulldozer teams, was completed by March 1961, a total of 506 acres having been cleared at a cost of £5,468, an average cost per acre of 216s. The costs of this clearing and stumping were very high, due to the difficult nature of the work and the difficulties experienced in ensuring adequate continuous supervision of the clearing gangs. Following this the labour gangs were engaged in the felling of potential tsetse habitat in a strip along the north bank of the Lundi River and its tributaries between the boundary of Lone Star Ranch and the Chuhanja Hills. In this work, completed in June, approximately 447 acres were cleared at an average cost of 15s. 4d. per acre, the total cost being £575.

Except for a certain amount of work in co-operation with the ranch owners in maintaining the Chiredzi clearings, it is not intended to undertake further clearing work of this nature in this part of the Sabi West area.

Approximately seven miles of cattle fencing have been erected by the department on the Chiredzi and Mkwasine clearings to restrict the access of cattle into the cleared areas and thus prevent overgrazing, with resulting bush encroachment.

(b) *The Humani and Devuli Ranch Area.* Continous patrol work with bait oxen and searches for pupae between August and October 1960, failed to reveal the presence of tsetse in those areas where a high incidence of trypanosomiasis amongst the cattle was, nevertheless, being recorded. Since the extensive residual insecticide spraying campaign, which was undertaken in August and September 1960, there has been some apparent remission in the severity of the outbreak. However, in view of the régime of treatment with trypanocidal drugs, which has been in force throughout the year, it is not possible to draw definite conclusions except to state that the insecticide campaign was not sufficiently effective to allow the withholding of drug treatment for long enough for the degree of success to be ascertained.

Intensive fly-round work in the Chipinda Pools area to the end of July, in connection with investigations on biting flies of all species, resulted in the capture of about 25 *G. morsitans*. This represents a very low apparent density and it has proved possible to maintain about 35 head of bait cattle in the Chipinda Pools camp area under a régime of weekly smearing and treating the sick animals with

Berenil. Usually not more than two or three cases of trypanosomiasis occur in these bait cattle each month. In September, however, the density of *G. morsitans* in the western portions of the Chuhanja hills showed a marked increase, parallel with that already observed south of the Lundi. It is evident that we are approaching the point at which our defence measures in the Lundi basin are to be tested by the build-up of tsetse-fly density foreseen three years ago. It is of interest, however, that no specimens of *G. pallidipes* have been taken at, or west of, Chipinda Pools since April 1959.

The new air-strip at Chipinda Pools was completed in June and passed inspection by the Department of Civil Aviation. It has since been used on several occasions.

(iii) *South Lundi*

In view of the possibility of a serious situation developing in the area to the south of the Lundi River, due to the tsetse-belt expanding southwards towards the Nuanetsi–Limpopo drainage system, mechanical bush-clearing operations were commenced in October 1960 in a strip of country extending ten miles north of the Bulawayo–Lourenço Marques railway line between the Matibi No. II African Reserve and the international boundary. These operations had the aim of presenting a barrier to the further extension of the tsetse-belt southwards. Within this ten-mile-wide strip as much vegetation as possible, which was judged to be suitable for tsetse, was removed. For the main part, this involved the clearing of *Julbernardia globiflora* and *Androstachys johnsonii* woodland. The areas cleared and the costs may be summarized as follows:

	£
Mopane woodland, 655 acres at 132s. 6d.	4,335
Julbernardia woodland, 1,134 acres at 114s. 6d.	6,483
Androstachys woodland, 4,131 acres at 109s.	22,690
Guibourtia-Spirostachys mixed woodland, 1,832 acres at 104s. .	9,530
TOTAL	£43,038

This clearing scheme was completed in June.

In addition to the clearing work, the bulldozers were utilized in the preparation of 130 miles of tracks in the area at a total cost of £1,402.

In connection with the preparation of bases for survey work in the area, three boreholes were sunk near the edge of the tsetse-belt beyond the forward edge of the cleared defence zone. Bait cattle patrols were commenced from camps at two of these boreholes and have already proved their worth by the capture, in June, of specimens of *G. morsitans* in the lower part of the Guluene drainage, which was previously thought to be free of tsetse. As the cattle at the two boreholes are kept separate from other cattle, they are in the nature of small test herds.

The hand clearing of the riverine fringing vegetation on the Tchingwezi River, which was commenced in July 1960 in an attempt to reduce the contact between African-owned cattle and *G. morsitans* along the eastern boundary of the Matibi No. II African Reserve, was completed in October 1960, a total of 665 acres having been felled at an average cost of 20s. 6d. per acre. The total cost of the scheme was £675.

As mentioned above, three specimens of *G. morsitans* were caught during June on the Guluene River drainage within about eight miles of the Moçambique border. This drainage was previously thought to be free of tsetse in Southern Rhodesia and these captures of *G. morsitans* bring the known edge of the south-eastern tsetse-belt several miles nearer the forward edge of the cleared defence zone within ten miles of the railway. These *G. morsitans* are the southernmost captures in the Federation of this species.

The increase in cases of trypanosomiasis recorded in the latter part of the year has coincided, as noted in the section dealing with the disease in Matibi II Reserve, with increased elephant activity. At the same time catches of *G. morsitans* at the Chibgwedziwa Gate began to increase, 78 being taken in August. To relieve this pressure the borders of the road leading to Fishaan's and the bush in the neighbourhood of the Tshingwedzi River clearings were sprayed with 3.5 per cent. dieldrin emulsion on September 21st. This led to an immediate reduction of the daily catch by 70 per cent. It is as yet too early to assess the effect on infection in the local cattle.

THE RESEARCH STATIONS

The two field research stations at Rekomitjie (about 1,700 ft., a.s.l.), below the Zambezi Escarpment in North-East Urungwe, and at Lusulu (about 3,200 ft., a.s.l.), in central Binga, are now operative though not yet to their fullest possible extent.

At the former, studies are being undertaken on the resting sites of *G. pallidipes* and *G. morsitans*; on trypanosomiasis infection rate changes from place to place and seasonally and, in anticipation that this may lead to an elucidation of results observed, to the changes in the composition of the blood meals taken by *Glossina*, related to the seasonal movements of the game population. The station is also used, because of the ease with which large numbers of tsetse can be obtained, for tests on the residual effect of insecticides on bark samples from the insecticide experimental reclamation areas.

At Lusulu, somewhat similar studies of tsetse habits are in progress, but here the main object is the study of various drug régimes in experimental cattle. Fifty head of cattle are in use at present, but it is intended to increase this number to 200.

Brief accounts of some of the work in progress at both these stations, as well as in the Laboratory in Salisbury, are given below.

(i) Trypanosome Infections in *Glossina morsitans* and *G. pallidipes* at Rekomitjie (B. M. Leggate and M. M. Robertson)

Infection rate work begun at Rekomitjie on a vegetation sampling basis in June 1960 was continued until May 1961, thus completing a year of this investigation.

As indicated by dissection during the first four months (Report for 1960), *G. morsitans* over the total period showed an infection rate more than twice that found in *G. pallidipes*.

The proportion (see Table 1) of proboscis only infections (presumed *T. vivax)* and proboscis and gut (presumed *T. congolense*) was the same in the two species, but *G. pallidipes* was found to show a higher rate of infection, with trypanosomes invading the salivary glands (*brucei* group), than *G. morsitans*.

Seasonal variations in the infection rate in *G. morsitans* were indicated. The highest rates occurred in July, August, September and October and the lowest rates appeared in January and February during the rains. In *G. pallidipes* no marked seasonal variations were apparent.

Table 1

Total		*vivax* type		*congolense* type		*brucei* type	
No. examined	% infected	% of those examined	% of those infected	% of those examined	% of those infected	% of those examined	% of those infected
*4,506 . .	18·6±0·5	10·3	55·4	7·9	42·5	0·4	2·1
**3,685 . .	8·6±0·5	4·6	53·9	3·3	38·5	0·7	7·6

* *G. morsitans* ** *G. pallidipes*

The overall difference in infection rate from the four vegetation types sampled (see Table 2) was not marked, although that from the evergreen vegetation on alluvium gave a significantly higher rate than the mopane woodland for *G. morsitans*.

Table 2

	Site 1 Evergreen vegetation on alluvium			*Site* 2 Evergreen drainage line vegetation		
	No.	No.	%	No.	No.	%
G. morsitans .	1,225	264	21·6±1·2	996	192	19·3±1·2
G. pallidipes .	1,560	146	9·4±0·7	1,230	100	8·1±0·8

	Site 3 Mopane/thicket contact			*Site* 4 Mopane woodland		
	No. examined	No. infected	% infected	No. examined	No. infected	% infected
G. morsitans .	1,153	200	17·3±1·1	1,132	184	16·3±1·1
G. pallidipes .	895	71	7·9±0·9	—	—	—

Consideration of results month by month, however, indicate that in *G. morsitans* the pattern of seasonal variations in infection rate may differ with type of vegetation or ecological community in which the flies are living. The evergreen vegetation of alluvium (site 1) showed a maximum infection rate in the late dry season and the mopane woodland area (site 4) a minimum during this period. It is suggested that these variations are related to the movement of game animals away from the mopane areas and into the riverine vegetation during the late dry season.

(ii) Infection Rates in Different Areas (A. M. Simmonds and G. F. Cockbill)

Estimations were made in various areas of the infection rate of *G. morsitans* with trypanosomes. The technique involved dissecting freshly caught flies at a field laboratory during a specially organized collecting trip. Table 1 shows the infection rate of *G. morsitans* from different localities during the dry season. It will be seen that in most cases, the *T. vivax* type of infection is more common than *T. congolense* type, and that the *T. brucei* type is rare. At Gwave, however, *T. congolense* occurred more frequently than *T. vivax*.

Examination of material from South Lundi in August gave an infection of 44.6 per cent., which is higher than any recorded in the literature.

Table 1

INFECTION RATE OF *Glossina morsitans* FROM DIFFERENT AREAS

Locality	Month	Proportion of Flies Infected		
		T. vivax type	*T. congolense* type	*T. brucei* type
Chikwira	June 1961 . .	17·7%	1·9%	—
Gwave	July 1961 . . .	12·1%	22·7%	1·5%
Chitaki	June 1961 . .	12·0%	3·0%	—
Chitaki	July 1961 . . .	6·7%	5·0%	1·6%
Umvumvudzi	August 1961 . .	8·8%	4·8%	—

An attempt was made to assess the infection rate of preserved flies, but in many cases, the preservative caused the flies to regurgitate the contents of the gut into the proboscis, making it impossible to identify the presence of trypanosomes in stained material. It was found that by removing the heads of freshly caught tsetses and preserving them alone, successful examinations for the presence of infections in the mouth parts could be made at leisure at the central laboratory. A new technique is thus available enabling collections to be made throughout the tsetse areas without the need to send specially trained and equipped staff.

Table 2 shows that although the infection rate recorded from fresh material was higher than from preserved material the difference was small.

Table 2

Area	Fresh material		Preserved material	
	Flies examined	Infected	Flies examined	Infected
A	250	10·8±1·9	250	10·4±1·9
B	359	18·4±2·0	357	15·7±1·9
C	132	26·5±3·8	78	26·9±5·0
Total .	741	17·3±1·4	685	15·0±1·4

(iii) Biometric Studies (A. M. Simmonds and G. F. Cockbill)

Information on the variations in size of *G. morsitans* from place to place and from time to time is accumulating. Collections made in the field are submitted to the central laboratory for examination. Since the weight of a tsetse varies widely during its nutrition cycle and, if it is a female, during the pregnancy cycle, it has a limited use in measuring size. Instead, use is made of the mean length of a particular vein in the wings (* Jackson, 1946), or of the area of a portion of the thorax (†Bursell, 1960). The latter has been shown to be closely correlated with the residual dry weight of the fly. Both measurements have been taken of *G. morsitans* collected in the Rekomitjie, Lusulu, Mtoko and South Lundi areas.

On both criteria, flies from Lusulu are largest and those from South Lundi smallest, and Rekomitjie flies are larger than Mtoko flies. Measurements were taken at monthly intervals at Rekomitjie and Lusulu to observe changes in size

during the wet season. It was observed that there was a 15 per cent.–20 per cent. increase in thoracic area of the fly population and a 2 per cent.–4 per cent. increase in the length of the hatchet cell vein between November 1960 and May 1961.

*Jackson, C. H. N. (1945) Habitat requirements of tsetse fly species. *J. anim. Ecol.*, vol. 14 (1) 46-51.

†Bursell, E. (1960) The measurement of size in tsetse-flies (Glossina). Bull. ent. Res., vol. 51, 33-37.

(iv) Insecticide Investigations (G. F. Cockbill)

The use of persistent insecticides is playing an increasing role in the control of tsetse flies. At present, the insecticide of choice contains dieldrin as the active ingredient which has the highly desirable property of long persistence. Like BHC and DDT it belongs to the chlorinated hydrocarbon group of insecticides. It was considered that although the phenomenon of resistance has not yet developed in tsetse, it would be wise to gain information on alternative insecticides, particularly those not closely related to the chlorinated hydrocarbons.

A series of tests was carried out on wild caught tsetse in which they were exposed to corresponding doses of several commercial insecticides.

The results indicated that the chlorinated hydrocarbon insecticides "Thiodan" and "Dieldrex 15" give a higher kill for a longer time than the others tested.

The organo-phosphate insecticide "Bayer S1752" gave a better kill than "Malathion". The results suggest that in the event of the development of resistance to chlorinated hydrocarbons in tsetses, an alternative is available.

(v) Trypanosome Storage (W. P. Boyt)

The Assistant Director of Veterinary Services (Research) has permitted limited storage space for trypanosome strains in the deep freeze storage cabinet used for bovine semen. As a result of this facility a beginning has been made on the compiling of a bank of local strains for future study when facilities and staff permit. The following strains have now been stored:

(a) *T. congolense* bovine strain from the Inyanga area.
(b) *T. congolense* bovine strain from the Chimanda area.
(c) B.1: Mixed strain *T. brucei* + *T. congolense* canine isolation, Chipinga.
(d) L.2: *T. brucei* group canine isolation, Chipinga district.
(e) P.1.: *T. brucei* group from a rhinoceros, Kariba area.
(f) *T. rhodesiense* human isolation, Kariba area.
(g) V.1.: *T. vivax* bovine from Humani Ranch.
(h) C.B.1: *T. congolense* bovine strain resistant to Antrycide isolated through a goat. This strain is avirulent for small experimental animals.

All blood was diluted with Ringer-Heparin (2 units Hep./ml. blood) as described by Cunningham, E.A.T.R.O. Annual Report 1959-60, and frozen immediately in 1 ml. amounts in glass tubes with tight fitting plastic caps. The freezing is carried out by immersion in alcohol and dry ice at −79°C. All the strains have remained viable and infective for mammalian hosts. V.1, the first stored, infected a bovine after 1½ years. There is, however, a high trypanosome death-rate, probably due to the rapid freezing and the method needs refining. This will be attempted in the coming year. There is strong evidence that in such storing of the polymorphic strains the optimum time for storage is when the long thin forms are at their peak.

A biometrical assessment of a single strain of *T. vivax* indicated that it fell within the limits of length of the East African strains, showing a chronic type of disease (Fairbairn: Studies on *T. vivax: Annals of Tropical Medicine and Parasitology*, vol. 47. No. 4. p. 394–405).

The strain R.1 was supplied to Dr. Ormerod of the London School of Tropical Medicine.

An interesting immunological study of the available strains is being carried out by Dr. Cookson of the Public Health Laboratory, Salisbury. Using fluoresence microscopy a common antigenicity between *T. vivax, T. congolense* and the polymorphs has been demonstrated. This is most interesting work which it is hoped will be developed and expanded in the future.

(vi) Drug Trials at Lusulu (W. P. Boyt)

Fifty head of cattle were made available and the trials began on the 26th July.

Initially there are five groups.

Group I: 10 head—Drug Berenil.

These cattle are injected when positive and as the drug has no prophylactic effect observations over a long period indicate accurately the number of infections which can be expected during that period. So far this method, suggested by the Kenya Veterinary Department, has turned out to be a delicate index providing a standard for comparison with other drugs. Over the two months reported it appears that at Lusulu the period of freedom from demonstrative parasitaemia is about 24 days.

Group II: 9 head—Drug Antrycide di-methyl-sulphate.

The whole group became positive between the 13th and 25th August.

The mean prophylactic period was 54 days with a range of 49–60 days.

Group III: 10 head—Drug Ethidium Bromide at 1 m.p.k.

All these animals remained free of parasites until the end of September—96 days. This was an interesting and unexpected result. The trial will be repeated.

Group IV: 12 Head—Drug Iso-Metamidium at dosage rates varying from 1–2 m.p.k.

All this group remained free of parasitaemia until the end of September—96 days.

This drug, the most valuable and universal sanative for strains resistant to other drugs, shows a marked local reaction with considerable tissue destruction and replacement fibrosis.

Used by intra-venous injections in sheep, at 1 m.p.k., death resulted in three minutes following a cardiac acceleration to over 250 per minute.

The tissue reaction, severe as it is, varies considerably and it has been suggested that one factor is an enhanced effect on muscle tissue rendered more susceptible to the drug by depletion of muscle glycogen. This too is to be investigated in the coming year.

Group V: 6 head—controls.

Four head of this group died in 60, 63, 69 and 80 days. More controls will be introduced later.

Two head of this group were inoculated with a Metamidium-Suramin suspension by intravenous injection at 10 and 15 m.p.k. There was no systemic reaction; the blood was cleared of parasites and remained clear to the end of September—43 days. This drug is expensive and unlikely to play an appreciable part in a chemotherapeutic programme.

In addition, 22 Black-headed Persian sheep have been introduced on the station. They are all showing positive smears but seem little affected and are gaining weight.

It has been felt for some time that the place of sheep and goats in the stock economy of trypanosomiasis areas is a neglected subject and this trial must be extended.

The nucleus of a pig herd, 2 in-pig gilts and one boar, is to be introduced during 1962.

Concurrently with these trials, observations are being carried out on the build-up of ectoparasites and endoparasites in an area which has never before supported domestic stock.

GAME DESTRUCTION AND FENCE PROTECTION

Larger Game		*Smaller Game and Carnivores*	
Elephant*	72	Duiker	1,233
Zebra	4	Steenbok	70
Buffalo	13	Sharpe's Grysbok	327
Hartebeest	1	Bushpig	266
Waterbuck	9	Warthog	495
Reedbuck	45	Klipspringer	36
Sable	84	Antbear	1
Roan	11	Baboon	581
Eland	6	Wild dog	13
Kudu	313	Hyaena	3
Bushbuck	168	Leopard	2
Impala	26		
TOTAL	752	TOTAL	3,027

* 43 of these elephant were shot by the Department of Wild Life Conservation.

Larger Game	752	(19·9%)
Smaller Game	3,027	(80·1%)
TOTAL	3,779	

TRAFFIC CONTROL RETURNS 1960-61

District	Sp.	Cars				Cycles				Pedestrians			
		No.	M.	F.	Total	No.	M.	F.	Total	No.	M.	F.	Total
North Urungwe . .	*m*	135,133	401	292	693	9,632	242	144	386	9,393	173	110	283
	p		—	—	—		2	—	2		4	—	4
Urungwe Native Reserve	*m*	1,356	1	5	6	2,974	2	2	4	2,657	—	—	—
Mtoko	*m*	20,206	33	20	53	3,917	14	15	29	4,873	3	7	10
Sabi East	*m*	1,668	—	1	1	15,750	158	99	257	82,711	501	329	831
	p		—	—	—		9	11	20		34	34	68
Sabi West	*m*	171	1	—	1	3,218	4	1	5	4,894	1	—	1
South Lundi . . .	*m*	621	1 S.N.R. 27	15	43	3,079	13 S.N.R. 84	14	111	7,376*	27 S.N.R. 49	26	102
Sebungwe	*m*	7,929	1,090	550	1,640	10,658	7,681	2,427	10,108	12,917	868	525	1,393
Chipinga	*b*	13	—	—	—	750	—	—	—	4,650	—	1	1

m — *G. morsitans* *p* — *G. pallidipes* *b* — *G. brevipalpis*

S.N.R. — Sex not recorded.
* — Includes 2,187 donkeys.

Flies per 100 cars . . . . 1·46
Flies per 100 cycles . . . . 21·85
Flies per 100 pedestrians . . 2·08

APPENDIX III

STOCK IN INFECTED AREAS AND TYPE OF TREATMENT

District	*Cattle*	*On prophylaxis*	*On curative treatment*
Zambesi, North-West			
Binga	6,757	1,269	5,488
Lupane	9,590	—	9,590
Gokwe	10,686	853	9,833
Zambesi Front Central			
Urungwe	3,010	—	—
Darwin	20,589	—	20,589
North-East Front			
Mtoko	8,052	—	8,052
Inyanga	13,032	1,353	11,679
Chipinga	22,753	4,624	18,129
Fort Victoria	7,491	—	7,491
TOTAL	101,960	8,099	90,851
TOTAL 1959–60	76,496	6,372	70,124

APPENDIX IV

SMEAR AND TREATMENT SUMMARY

District	*Smears*	*Positive*	*Inoculations*
Binga	6,544	134	14,352
Lupane	6,239	178	10,400
Gokwe	3,054	109	5,930
Urungwe	4,992	6	13
Darwin	5,516	19	77
Mtoko	2,348	177	2,458
Inyanga	1,702	157	10,527
Chipinga	2,314	338	34,462
Fort Victoria	3,005	189	4,041
TOTAL	35,714	1,307	82,260

APPENDIX V

CLASSIFICATION OF THE SMEARS FROM CATTLE IN INFECTED AREAS

District	*T. congolense*	*T. vivax*	*T. brucei*	*Mixed*	*Untyped*	*Total*
Zambesi, North-West						
Lupane	109	66	—	3	—	178
Binga	87	46	—	—	1	134
Gokwe	96	10	3	—	—	109
Zambesi Front Central						
Urungwe	5	1	—	—	—	6
Darwin	16	3	—	—	—	19
North-East Front						
Mtoko	145	30	2	—	—	177
Inyanga	119	36	—	2	—	157
South Eastern						
Chipinga	229	109	—	—	—	338
Fort Victoria	16	167	—	6	—	189
TOTAL	822	468	5	11	1	1,307

Comparative figures over three years:

	Smears	*Positive*	*Inoculations*
1958–59	38,724	930	91,421
1959–60	51,005	1,398	115,773
1960–61	35,714	1,307	82,260